# Railway Maintenance Engineer

Volume 15 December, 1919 Number 12

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering* and *Maintenance of Way.*)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BLDG. CINCINNATI: 1ST NATIONAL BANK BLDG.
LONDON: 85 FLEET ST. E. C. 4. CABLE ADDRESS—URASIGMEC.

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Entered at the Post Office at Chicago, Ill., as mail matter of the second class.
Subscription price, $2.00; foreign countries, $2.50.
Subscription agents for Great Britain and Egypt: Dorland Agency, Ltd., 16 Regent Street, London, S. W. 1.

WE GUARANTEE, that of this issue 8,500 copies were printed; that of these 8,500 copies, 7,844 were mailed to regular paid subscribers, 76 were mailed to advertisers, 22 were mailed to employees and correspondents, and 558 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 96,620, an average of 8,052 copies a month.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

22


## CONTENTS



**The Master Painters' Convention**

Railway officers who are inclined to question the value of the minor maintenance of way associations will find it profitable to read the report of the Maintenance of Way Master Painters' Association convention appearing in this issue. This, the smallest of the associations in the maintenance of way field, has effected a marked improvement in the character of its work during the last four years and at its recent convention it presented a program of unquestioned value to the members and the railroads which employ them. Sensing the problem of the times, this meeting was devoted largely to the discussion of the labor problem and its solution through the use of labor-saving equipment, improved welfare work for the men and the training of workmen by apprentice systems or otherwise. On the other hand, the technique of the craft was not overlooked and many problems of bridge and building painting were thoroughly discussed. The preparation of papers and reports for presentation at the meeting and attendance at these conventions imply a personal sacrifice on the part of the member, both in time and money, which are prompted solely by a love of his work. Thus far this incentive has been almost entirely personal, for, although the railroads profit very largely by the work of these smaller associations, they have done little to encourage attendance by their employees. In these days when all manner of organizations of railway employees and subordinate officers are being formed solely to further the selfish interests of the men themselves, it behooves the railway management to offer every inducement for men to interest themselves in organizations designed permanently to encourage better and more intelligent work on the part of the workmen for the companies which employ them.

**The New Scale Specifications**

The new specifications of the American Railroad Association for track scales published in abstract on another page of this issue constitute a distinct advance in railroad scale practice. The new specifications are based largely on the valuable work done by the United States Bureau of Standards during the last five years or more and place the administration of this important adjunct to railway transportation on a more scientific plane than has been the case in the past. Whereas scale design heretofore has been largely empirical, the new specifications definitely recognize that scales, like any other load-carrying structure, can and should be designed and investigated along strictly analytical lines. Thus the capacity of the scale as now expressed really signifies the heaviest car it can carry, whereas the former expression for capacity was an arbitrary term that really meant but little. However, these specifications embody other considerations than those of design. The need for simplicity and convenience in adjustment and economy in maintenance has had a definite influence on the establishment and formulation of many of the requirements in these rules. But aside from the technical superiority of these new regulations, their chief value lies in the sponsorship of the American Railroad Association, under which their adoption by the railroads of the country is assured.

The use of power-operated tools dates back to the origin of the waterwheel and the treadmill centuries ago, but the great impetus to the use of such equipment was received when Watt perfected his steam engine. The subsequent introduction of the electric motor and the internal combustion engine produced no such revolutionary changes since they served to support rather than to replace the first great prime mover. Thus, it is not until the present time that we have come to a state of affairs which promises to afford an incentive for labor-replacing equipment second only to that afforded by Watt's invention. Labor's position today represents a condition never before encountered. The output to be obtained from a dollar's worth of labor under present circumstances, together with the continuation of restrictions on foreign immigration, can mean but one thing—the substitution of the power tool wherever it is humanly possible. All studies made in times past to determine the relative economy of hand and machine work are now absolutely worthless. Old relationships mean nothing today. The task is clearly before us. We must compensate for labor shortage and labor inefficiency by replacing it with machinery.

**The Opportunity Is Here**

The article by W. F. Rench in this issue describing the high standards of track construction followed in the sidings and yards of a large industrial plant in the East brings out a marked contrast with the usual practice in this regard, and directs attention to the common tendency to neglect those tracks which do not carry main-line traffic. While the effort to maintain a fixed relation between earnings and maintenance expenditures is, no doubt, responsible for this condition to a considerable measure, the real influence is the feeling that accidents resulting from defective track, in cases where operating speeds are normally limited to about five miles an hour, are not likely to be of a very serious nature as compared to those taking place under normal main-line speeds. This theory, however, is not always borne out in practice, for engines occasionally turn over on passing tracks with serious and sometimes fatal results. While there is considerable merit to the idea of controlling expenditures by their relation to the revenue earned, it is necessary to keep in mind that derailments may result in delays to traffic and expenses for repairing the damage done, which, while not always readily measured, may aggregate much more than the additional expense necessary to keep the tracks in proper condition. The adequate maintenance of all tracks used by railroad equipment will make for much smoother operation of the properties and permanent economy.

**Better Maintenance of Sidings**

One of the most marked changes which the maintenance of way department has witnessed in recent years has been the development of a variety of types of power units for use in the pumping of water at roadside stations. Not many years ago the steam plant was almost universally installed and it proved very satisfactory because of its ready adaptability to the varying requirements of different stations and its ease of operation without trained employees. With the advent of the gasoline engine in the general industrial field, it was but natural that it should be adapted to this service. A few years later the development of an engine to operate on poorer grades of oil with a resulting economy over gasoline brought about the rapid introduction of the crude oil engine. During this period electricity has also become available in many communities at rates sufficiently attractive to warrant serious consideration. Thus one finds all of these various forms of power units available today and they all possess advantages under certain conditions. With the wider range of selection offered him, the water service engineer is, therefore, confronted with the responsibility of studying each individual installation and selecting that type most economical for the conditions existing at that point. By making such a study large economies are possible. These economies are being realized on the more progressive roads, although a study of the plants still in service on many roads indicates that there is much still to be done there.

**The Selection of a Pumping Unit**

That maintenance of way engineers are beginning to receive the recognition to which they have long been entitled is indicated by the fact that four of the seven regional directors are men who gained their early experience in this branch of railway service. A. T. Hardin of the Eastern region spent ten years in the maintenance of way department of the Southern and the New York Central, being a division engineer and later engineer maintenance of way of the latter road, before entering the operating department. L. W. Baldwin, regional director of the Allegheny region, gained his early railway experience in the maintenance of way department of the Illinois Central, where he was for a number of years engineer maintenance of way. R. H. Aishton, regional director of the Northwestern region, spent nearly 20 years in the maintenance of way department of the Chicago & North Western, where he was superintendent of bridges and buildings and division engineer before entering the operating department. B. F. Bush, regional director of the Southwestern region, likewise had extended engineering experience on a number of western roads, including the Northern Pacific and the Union Pacific, on both of which systems he was a division engineer. This recognition not only demonstrates the fact that experience in the engineering and maintenance of way departments of the railway constitutes excellent training for operating and executive positions, but it should also provide an incentive for younger men in these departments to familiarize themselves with the broader problems of transportation so that they will be fitted for promotion beyond the limits of their own department when opportunity offers.

**Four Engineers Are Regional Directors**

## THE NEW VIEWPOINT ON EMPLOYMENT

ELSEWHERE in this issue four railway officers discuss the seasonal employment of bridge and building forces. The report of the Maintenance of Way Master Painters' Association convention also contains a paper on the same subject from the painters' standpoint. A reading of these articles should serve to convince anyone of the fact that a plan for permanent employment must surely play an important part in the solution of the labor problem. It should also be obvious to any student of labor matters that, after all the revolutionary changes of the last five years, such questions must be viewed from an entirely different standpoint than was the case in the past.

All of the papers referred to above, and particularly the introduction to the articles on the employment of carpenters throughout the winter months, approach this subject from the standpoint of the economic forces which demand a change of policy in this regard. Briefly it is shown that much work can be done profitably in the winter time, that permanent employment will attract a better class of men and that the roads would be saved the loss they now experience in the time spent in training un-

skilled workmen who leave them when the training period is ended. There is, however, still another side to this problem, namely, the human side. There is no gainsaying the fact that the employer's failure to consider the human element in the past is one of the causes of the present labor difficulties, and it cannot be denied that those employers are now securing the best results with the least difficulty who are devoting the largest attention to the human side of employment. The basic principle of all these movements in the large corporations is to do m the mass what the executive of a small concern can do by force of his own character, namely, to obtain increased output from the employees through an enthusiasm engendered by a friendly interest. In a small undertaking this is accomplished by personal contact, but in a large concern it demands a well-organized agency in the interest of the physical, mental and moral welfare of the employee. To a minor extent, as in the supply of purely physical comforts, this work may be directed with profit to the interest of temporary employees, but the real, far-reaching results are only secured in the case of the man permanently on the pay roll. Consequently it should be obvious that very little can be done along this line in the maintenance department of the railroads as long as it is a prevailing practice to lay off large numbers of men each winter with no thought of what they must do in the support of their families in the meantime.

## A MORAL OR A LEGAL OBLIGATION

IT HAS BEEN generally acknowledged that a railway bears a moral obligation to those dependent on it for transportation, to maintain its properties in a condition such that safety of travel will not be unduly endangered. Indeed, the police powers of the states have been exercised in some instances to enforce this obligation. Under the terms of the standard contract which the Railroad Administration prepared and which many of the roads have signed, the government is obligated to return the properties to their owners at the end of federal control in the same condition in which it received them, with the proviso that if it elects to make the same expenditures as the corporations had made during the test period (with proper provision for differences in costs of labor and materials) this shall be construed as a complete compliance with the terms of the contract.

The situation has risen recently in certain instances where it is claimed by the corporations that the maintenance of tracks has been curtailed to the extent that safety of travel is endangered. In reply the Railroad Administration has taken the position that it has performed its obligation when it has made expenditures on the property equivalent to those spent by the owners during the test period. This raises the interesting question regarding the moral obligation of the Railroad Administration to the public.

It is commonly known to railway men that one may curtail tie renewals one year without serious results; retrenchment may even be carried two or three years if done judiciously. However, if this is continued indefinitely the results cannot but be disastrous. Not a few roads were inadequately maintained during the test period, but in many of these instances the factor of safety was such that travel was not immediately endangered. The question of safety has now arisen by reason of the continuance of this inadequate standard of maintenance throughout the two additional years of federal control, during which time it is claimed that the factor of safety has been lowered to the vanishing point. Under these conditions it would appear self-evident that the government, which is now in control of the properties and in charge of expenditures for their upkeep, cannot evade its responsibility to maintain all of the roads under its charge safe for operation. The public which uses the roads can and will expect no less. The legal responsibility for the payment of the amount over and above that comparable to the expenses of the test period is a secondary consideration which can be determined later on the basis of equity. Even though the period of federal control is rapidly drawing to a close, the basic consideration remains the same.

## THE EXPERIMENT WITH THE CENTRALIZATION OF PURCHASES

SHORTLY AFTER the inauguration of government control of the railroads of this country, numerous direct or inspired statements emanated from Washington regarding the advantages which would result from the unified operation of our transportation system by the government, and a number of measures were introduced which looked toward permanent rather than temporary control. One of the innovations which aroused active opposition at the time of its introduction, but for which much was claimed by its sponsors, was the centralization of purchases. Fortunately for the maintenance of way department this concentration of the buying of the materials used in this branch of railway operation did not reach beyond rails and ties, but the experience in the buying of even these two commodities may now be reviewed with interest.

At the time the roads were taken over orders were standing on the books of the steel companies for over two million tons of rails placed by the individual roads in anticipation of an increase in price. The government realized the advantage of this foresight on the part of the corporate managements through its ability to secure deliveries on these orders at prices far below what it would have then had to pay in the open market, but it has done little further than this. Although the roads are seriously in arrears in their renewal of rails and although the 10-year average for renewals on the roads under federal control was approximately 1,500,000 tons and for the three-year test period 1,350,000 tons, the government has ordered only 240,000 tons of rails during the two years which it has had control of the properties. With the end of government control but a few weeks off, it is evident that the roads will be returned to their owners with depleted stocks and without any provision being made by the government for their supplies for next year, in marked contrast with the condition under which they were received. To meet with the situation as far as possible a number of the corporations have already negotiated tentatively with the manufacturers for their next year's requirements in order that they may have the materials necessary to proceed with their normal maintenance programs next spring.

The situation with reference to ties is even more serious. Many of the roads which have followed the practice consistently for years of maintaining an adequate reserve to permit proper seasoning and treatment and which entered the period of federal control in this condition are now facing the return of their properties with their stocks largely or entirely depleted. Of at least equal seriousness is the fact that the ties installed in track this year have been as a whole inferior in the quality of timber. The result of the installation of large numbers of ties of this character is that the renewals will be abnormally large in a few years, the charges for which the roads will have to bear. In reviewing this experiment in the centralized purchase of materials, the maintenance of way officer can arrive at no other conclusion than that it has been far inferior to the private control of purchases both in the amounts of materials purchased and in their quality.

# KEEPING CARPENTERS THROUGH THE WINTER

## New Industrial Conditions Place Question of Permanent Bridge and Building Forces in a New Light

IN TIMES past the employer of labor enjoyed the advantage of what was practically a normal surplus of labor. Additional men could be added to the forces whenever the amount of work required and were as readily dispensed with when the demand for them ceased. This naturally led to the custom of seasonal employment of a large part of the men engaged in outdoor work in all parts of the country where the winters are severe. Men were discharged in the fall with little consideration of their welfare or that of their families, and when work opened in the spring there were always enough men out of employment who were ready to go to work.

As a consequence of the late war or for other reasons, this has all been changed. Immigration, which always supplied us with a surplus of labor, has been cut off, and the indications are that it will not be restored in anything like its former volume for a long time. We are therefore confronted with a permanent labor shortage to a degree not unlike that with which the employer has been struggling for the last four years. The railroads have suffered as much as anyone because of this, and with a continuation of the situation before them it is up to the men responsible for the results of labor's efforts to do whatever is possible to overcome this obstacle to effective work.

Under present circumstances, the seasonal employment of men is particularly objectionable, especially as applied to men in the trades, since any man with sufficient ambition to be a first-class skilled workman is not content to be idle all winter, and with the present labor shortage, it is not necessary for him to be. The personnel of the railway bridge and building forces has suffered sorely from this cause and the wide-awake supervisory officers have realized for some time that seasonal employment is largely responsible. Below are presented discussions by four bridge and building officers on the need for organizing the work of their department on a permanent year-round basis:

### MUCH WORK MAY BE DONE IN WINTER SEASON

By E. M. Grime

Supervisor of Bridges and Buildings, Northern Pacific, Dilworth, Minn.

To maintain an efficient organization in the bridge and building department, stability of employment must be assured. The competent mechanics who must necessarily be the backbone of this department will not remain unless they are certain of steady work throughout the year. In northern latitudes, therefore, where there is usually inclement weather for from two to four months of the winter, one of the most serious problems confronting the officer in charge of bridge and building maintenance and construction is how to hold his working organization in shape so as to retain all of the desirable men and at the same time handle his work to good advantage through this period.

There is little if any carpenter work that can be carried exactly as economically in the cold winter season as during ideal warm weather, but when we consider that without any serious hardship or complaint on the part of the men it is usually possible during the winter to reduce the regular working time so as to take advantage of the best daylight hours as well as to lay off entirely during stormy days, it is plain that by keeping the men satisfied we are well repaid, even though the actual labor costs may exceed the regular charges by as much as 10 per cent.

Under present difficult labor conditions, during the busy working season there are bound to creep into the organization a few men who, during the more slack winter season, can be spared to advantage. With this class of help weeded out and usually a few of the older men laying off of their own volition, taking vacations, etc., during the cold weather, the most efficient men remain and for them continuous employment must be provided if they are to be kept satisfied and retained permanently in the service. We must not overlook the fact that building contractors are always on the lookout for good men and that they keep such men on the pay roll at a loss if necessary during the winter season in order to have them available as soon as weather permits of outside work

With these conditions always in mind, it is advisable to start early in the working season to classify the work so as to save for the winter, as far as practicable, certain kinds of work which can be handled during cold weather. As a rule all kinds of heavy, rough carpenter work, requiring little if any fine detail, can be handled to advantage during the winter. This comprises such work as the repair and construction of frame and timber icehouses, loading and unloading platforms where no excavation is involved, depot and freight-house platforms, frame engine houses, coaling stations, stockyards, etc. Bridge crews are employed to advantage in the renewal of bridge ties and a large amount of miscellaneous repairs to pile and frame trestles, especially in cases where there is water under the bridges, and during the winter season the ice makes a good working floor. On railroads having water-front facilities, such as timber docks for handling coal and iron ore, there is usually work for all available bridge crews making necessary repairs, and the winter is about the only period when this work can be done without serious interruption to business.

Many bridge foundation jobs are also handled most advantageously at this season of the year when water is low and constant in volume, and the surrounding ice greatly facilitates the handling of material and equipment. The placing of cast-iron and concrete pipe culverts under high embankments can also be handled to advantage during the winter season. Driving a tunnel through the embankment when the ground is frozen is often much more economical than providing a temporary bridge to support the track for an open excavation and taking chances on the difficulties incident to frequent rains in the summer season. Much of this work warrants the use of a good proportion of skilled bridgemen to help out the laborers. The carrying on of concrete work of all kinds is becoming more common during the winter season, and there are many situations on the railroad where, with slight additional expense for housing, this work can be handled to advantage, thus providing work for skilled men at this season.

With these suggestions for outside work and the innumerable small inside repair details continually coming up in the bridge and building department, there need be no difficulty in working to advantage and thus holding all of the skilled men during the winter season. Such a policy is exceedingly desirable, especially at the present time, when all classes of labor are displaying such a restless attitude and seem disposed to find fault with its conditions of employment.

## PLAN HAS BEEN APPLIED SUCCESSFULLY

BY H. RETTINGHOUSE

Chief Engineer, Chicago, St. Paul, Minneapolis & Omaha, St. Paul, Minn.

At the recent annual convention of the American Railway Bridge and Building Association certain remarks were made by one of the leading members which, to my mind, touched the keynote of the present labor situation. These remarks showed that the pride taken by supervising officers of bridge and building forces only a few years ago in the efficiency of their forces is no longer justified, as these forces can no longer be called an efficient body of men. This article is not called upon for an analysis of the reasons for this sad state of affairs, but with a knowledge of certain existing conditions relating thereto which are fully appreciated by all in responsible charge of bridge and building work, the writer believes that the discussion of one perplexing problem and the suggestion of means to solve it may be a good step toward increasing efficiency.

The problem is that of the reorganization of forces, or, to speak more plainly, the reduction of forces at the beginning of each winter season. This, of course, refers only to those regions in which the winter weather is usually severe and for that reason presents an obstacle to the conduct of certain items of maintenance and construction work. It does not affect those regions of more or less perpetual sunshine and warm weather which many railroads are fortunate enough to enjoy. The problem is all the more serious at a time such as the present one, when industrial unrest threatens to shake the foundations of society.

We of the northern countries have been accustomed to arrange our allotted work to be done during the open season. Usually we begin our work as soon as the snow has disappeared and the frost is out of the ground—about the middle of April—and finish it about December 1. Often we encounter no real winter weather until about January 1, but the reduction of forces in accordance with an ancient and established custom, nevertheless, begins about November 1. This has been decreed and foreordained since time immemorial, and hence we are continuing to arrange our work in that way. No one seems to realize how obnoxious the system is and that it is a fatal mistake to demoralize an organization at the beginning of each winter season by leaving some crews in skeleton form and disbanding others entirely, only to reestablish the organization again in the spring. It would be so easy, in my opinion, to change all of this. This statement is founded on a two-year experience on a certain railroad in Wisconsin where the management adopted the policy of having bridge and building forces balanced, or nearly balanced, throughout the year. This railroad had many wooden bridges, pile and timber trestles, although wooden spans, Howe trusses and like structures had all been replaced with steel structures. There were also many wooden station platforms and sidewalks. The majority of station and other buildings and bridges were of wood construction; in fact, the general character of all buildings and bridges was not much different from the character of such structures as they exist at the present time, so that the principle applied at the time of which I speak is applicable today.

It is commonly assumed and ordained by the higher officials that the rebuilding of pile and timber bridges, in order to be performed economically, must be done during the open season. No one will dispute the truth of this assumption in so far as the driving of piles, replacing of bulkheads and similar work is concerned, nevertheless the principal and the bulk of the work of rebuilding these structures may be done just as economically in the winter season. There are on many roads certain pile and timber structures through swamps and bogs which are always maintained as such, as they are the most economical structures for such locations. These structures can be rebuilt to much greater advantage, for economy and otherwise, during the winter season than they could be built during the summer. Swamps are often covered with several feet of water and the forming of ice will save vast amounts otherwise spent for floats, rafts and other falsework. Wooden spans, Howe trusses, etc., of which there are still a good many in existence, may be replaced just as economically in the winter as in the summer months.

Roads which have lake terminals with wharves and docks must naturally defer work on these structures until winter weather, when navigation is closed, as it is generally out of the question to do that work during the navigable season. I have, even in years past, found it entirely practicable and economical to place permanent work, such as masonry and concrete structures, during severe winter weather where operating conditions prevented doing the work during the summer. On many roads, ice houses are filled by railroad forces, and no one will dispute the claim that bridge and building forces are especially fitted to supervise work of that kind, and on many roads forces otherwise laid off could be economically employed in that way.

No set rule can, of course, be laid down as to the particular work that may be deferred by this or that railroad to the winter season, but doubtless there is not one railroad in the colder regions but could find some way and could find certain classes of work deferrable to winter weather in order to balance all the work throughout the year. The extra men who under the present arrangements realize that their jobs will cease with the appearance of the first snow flurries would doubtless become more energetic and more efficient could the way be opened for all-year employment for them.

The reduction of forces, as pointed out, has the further unpleasant consequence, considering present regulations, general orders and supplements, of forcing us to recognize seniority. That is, we are required to hold the less

efficient older men rather than the younger and more efficient ones. I believe that with a persistent effort on the part of those in charge of bridge and building work to impress their superiors with the advantage of permanent forces throughout the year, we will again be on the right road to obtain efficiency.

## FORCE IS REQUIRED FOR EMERGENCY WORK

By R. H. Reid

Supervisor of Bridges, New York Central, Cleveland, O.

It would seem advisable to maintain at least a reasonable force of bridge men during the winter season (possibly one gang on each division) and, if the work can be so arranged that part of it can be economically done in the winter, it is preferable to maintain a uniform force all the year, as, by so doing, there is at all times a force of experienced men available for any kind of work.

There is much work which can be done practically as well in ordinary winter weather as during the summer; for instance, tie renewals on steel structures, where there is no change in grade of the track; the erection and repair of steel structures, the construction and repair of many pile frame trestles and other bridges where men do not have to work in water, and the placing of many pipe culverts where the ground is not frozen hard.

Some work, also, can be done best in winter where it is desirable to have ice for the men to work on, such as repairs to pier and drawbridge protections and fenders which cannot very well be dismantled, and where there is not room for the men to maintain rafts for working, during the season of navigation. Also, much important work on drawbridges and bridge machinery can be done better in the winter when navigation is closed, and the bridge can be permanently closed and blocked up, than in the summer when the bridge and its machinery must be kept in condition for immediate use at all times. Repairs to masonry piers and abutments of drawbridges, especially replacement of masonry under bearings, can frequently be made in cold weather when the bridge can be blocked up in such a way as to take the bearing temporarily off the regular bearing points, for the purpose of putting in concrete or stone, as these places can be kept sufficiently warm, even in cold weather, by proper protection, to enable the concrete to set firmly before freezing. It is very difficult to make a good job on masonry repair of this kind during the summer season when the bridge must be kept constantly moving, and it is almost impossible to keep the load off the green concrete long enough to permit of proper setting.

During the winter, as well as in the summer, there are many emergency jobs to be done which must be done quickly, such as the repair and replacement of structures made necessary by fires, wrecks, washouts or other troubles, supporting tracks for protection, and repairs of water main, sewers and other underground work which cannot always be foreseen, and, if the entire force is laid off, it is necessary to get enough men together to take care of these jobs, and, in case of a break in the track, the time it takes to get a gang together may result in serious delay.

Another reason for maintaining a uniform force during the entire year is the encouragement it offers men to remain with the company, who, if laid off during the winter, are liable to drift away to other employment, especially if the other employment is steady for the entire year. Another point to consider is the fact that if everyone attempts to do all the season's work during the summer or mild weather, it is more apt to cause a labor shortage during that season than if the work is so arranged as to do part of it in the summer and part in the winter.

Since nearly all forces are now working on the eight-hour basis, the men can work a full eight-hour day during the winter without having to depend on artificial light, thus doing away with one very strong reason which formerly existed for cutting down the force—lack of daylight for a full ten-hour day. With reasonable foresight and careful planning, by doing in the summer the work which requires warm weather, and postponing until winter work which can be done as well in cold weather, the bridge supervisor could maintain a uniform force during the entire year.

## THE EMPLOYEE'S SIDE SHOULD BE CONSIDERED

By H. C. Schwartz

Master of Bridges and Buildings, Grand Trunk, St. Thomas, Ont.

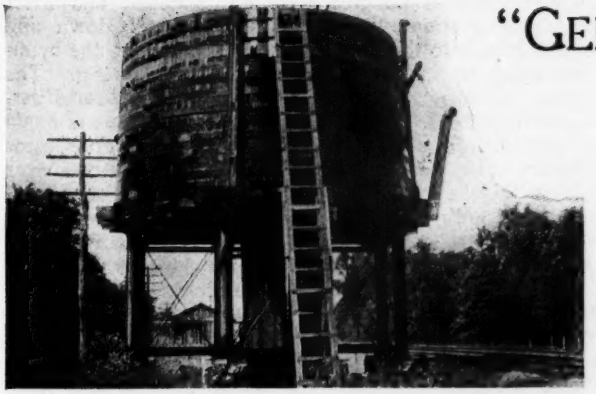
From the viewpoint of the workman, year-round or permanent employment is most gratifying, in that there is a feeling of security which encourages and prompts one to greater efficiency, creating a keener desire on his part to give satisfactory service. On the contrary, where the forces are materially reduced in the winter months one will invariably find a lack of interest on the part of the employee, who realizes that he will be required to shift as best he can during the months when an income is most needed. If he is a man with dependents, he wonders, quite naturally, how he is going to make ends meet, with very little if any of his summer earnings left. In this state of mind a man lacks the energy and ambition of one who is insured steady work, and as a consequence his power of production is weakened.

This is a matter that should not be cast off lightly by the employer, for steady employment will demand a better class of men with a *will* to do, and with the mind at rest the healthy body will respond. Therefore it is worth while and much is to be gained by holding the forces together during the winter months. The trained employee is just as important to the bridge and building department as to other departments. The transient workman is constantly changing and lacks the experience and skill of even a bridge carpenter. This, of course, applies to regular forces and would not include extra forces required for extraordinary work which can only be carried on during seasonable weather.

There is much work that can be carried on successfully during the winter months, for instance, renewal of bridge ties, trestles of any nature, wood, steel or concrete (the latter where piles and slabs have been manufactured in advance). With a dry winter the renewal of culverts in wood or pipe may be carried on.

Most railways have more or less dock work, and where of wood, work on them can be carried on in winter months without added expense; in fact, I think with a saving where ice formation will aid in movements. In fact, I have known of instances where the use of heavy ice was a great saving in the movement of land pile drivers, doing away with the necessity of floats or scows.

To undertake to enumerate in detail the various classes of work which can be carried on in winter months would occupy too much space; it would perhaps be sufficient to say that if masonry, including concrete and brick work, and the finer class of building work, as well as outside painting, were taken care of during the seasonable months, other classes of work with but few exceptions can be carried on during the winter months, and in many cases to advantage. During heavy snowstorms or other disturbing features to which most railways in northern latitudes are subject, the men employed on such work will be available when most needed, and I believe if heads of departments were permitted to plan their work, that there would be no difficulty in maintaining a permanent force.



# "GEE! I WISH'T I WAS A PUMPER"

BY CHAS. H. SMITH

"GEORGE THE PUMPER," as he was familiarly known to all the trainmen on the Pan Handle division of the C. St. P. R. R., gazed disgustedly at his rather decrepit old pump in the pump-house at Woodville. It was a veteran which had seen service at more than one place previous to being installed at Woodville and it showed the scars of service all over. The antiquated steam engine which operated the pump was almost equally decorated with service stripes and George had declared a hundred times that both ought to have been mustered out of service long years ago.

The particular defect which George was looking at in such great disgust was one which had given him trouble many times before. It consisted of a long crack in the pump cylinder caused, the repairman had told George, by freezing up at Cass City, the last place with which the outfit had been blessed. Only George would use another word than "blessed" to describe the condition Cass City was in when it possessed the outfit. When the old pump and engine had replaced a still older pump and engine at Woodville this crack had given George considerable cause for worry, but the repairman had thought that they might patch it up by pounding it full of lead. If it should be sent to the shops for welding it would be a long time before it was returned, the repairman had said. In fact, he seriously doubted if it ever would get back. And the water service department simply could not have the pump out of commission at Woodville very long. Therefore for over two years George had been pounding lead into the cracked pump. It was enough to test any man's temper. To get up steam, start the engine and get the pump working nicely and figure out how long it would take to fill the tank at the rate of three feet per hour, and to decide that at noon it would be full, and then to have the lead in the pump cylinder crack break loose and a stream of cold water shoot out of it and hit you in the back of the neck as you stood in the pump-house door watching the gage on the water tank, well—wouldn't it make you mad?

Maybe your temper is more angelic than George's and possibly you wouldn't get a bit angry, but George did. If he hadn't he would have hardly been human. Besides, this was not by any means the first time it had happened. Dodging the stream of water which shot into the air in jerky spurts like the blood from a severed artery, George rushed over to the engine and shut off the steam. "Blankety blank that blank blank pump!" he exclaimed whole-heartedly as he pulled out his big bandana handkerchief and wiped the water from his neck and head. By the time he had most of the water mopped from his body the engine had come to a stop, and, picking up his hammer and a sheet of lead George walked over to the pump and stood gazing at it in deep disgust, as recorded in the opening of this narrative.

But there was more than disgust written upon George's face. There was an expression of helplessness, as if he thought that the old pump's condition was hopeless. Wherein he was undoubtedly right. For this reason he did not start repairing it right away. What was the use? Had he not done it scores of times before? And yet the locomotives on the C. St. P. must take water at Woodville. As he still hesitated about starting to work on the leaky pump the whistle of an engine came to his ears and, turning quickly, he went outside. It was coming from the east—a westbound extra—and a few minutes later it came to a grinding stop at the standpipe. When he saw that the extra was going to stop George quickly strode inside the pump-house, looked at the water-glass, banked the fire and then leaving, locked the door. Jumping on the freight train as it pulled slowly by him, he climbed up the ladder to the top of the car and sat with legs swinging off the side.

Now, George was not jumping the job, as you might suppose. Far from it. Instead, he was taking this opportunity of getting over to Blanchard, fourteen miles west of Woodville, where there was another large tank which it was George's duty to keep filled also. And as he lived in Woodville and the train service to Blanchard was poor, he always caught the first train that he could for that place, filled the tank there and returned home to Woodville on No. 6. These two tanks, one at Woodville and one at Blanchard, constituted George's job. After filling both of them in one day he had nothing to do until the next day. George had no complaint to make until the company put on the big new eleven-hundreds. These monster engines had a tank almost as large as an automobile car, and the first time that one stopped at Blanchard and pulled down the pipe to take water the gage on the tank had gone up three feet. George's heart had sunk. Almost an hour's pumping gone in seven minutes! And worse yet, what if they should begin running double-headers? These big engines, coupled with the old outfit at Woodville and the balky gasoline engine at Blanchard —well, George decided that it was only a genius that could keep enough water on hand for the "hogs." Hogs —somebody had named the eleven-hundreds correctly, all right, thought George, as he sat up on top of the swaying box car.

After all, these rides from Woodville to Blanchard were rather pleasant. George knew every field, every road and almost every farmer between these two towns, and he watched the growing things with almost as much interest as if he owned them himself. In fact, as the train rolled along between woods and meadows and corn fields and orchards, George decided that he had a pretty good job after all—even with the leaky pump he had to contend with. It was, after all, only a part of the game. That was his business—to keep things going in spite of obstacles.

Thinking these thoughts, George was in quite a pleasant state of mind when the train pulled up the long grade into Blanchard. When the crest was reached he dropped off, and after waiting for the long string of cars to pass him he started back down the track towards the tank and pump-house. As he came opposite the big green water

tank a loud noise suddenly broke the rural stillness. It sounded like the blows of a trip-hammer, only, of course, it wasn't a trip-hammer, for Blanchard is only a tank town boasting of no such modern machinery. The effect of this sound upon George was magical. Glancing hastily around the ground, he stooped down quickly and grabbed up four or five good-sized stones. Then, straightening up, he hurled them with more force than accuracy towards the tank as rapidly as he could. They hit the sides of the structure with resounding cracks which reverberated through the cavernous interior of the nearly empty tank. Two yellow-hammers fled in great haste—George had missed them.

"Confound those pesky birds! I'd give five dollars to wring their necks!" said George in a tone which left no doubt as to his sincerity. "They've drilled eleven holes in that tank already, and now that I've just got 'em all plugged up they're at it again. I suppose if I had a steel tank they'd bring drills with 'em."

It was evident that George was convinced that the yellow-hammers bore him malice. To a casual observer it might have seemed that either the birds were after worms in the sides of the old tank or else they had decided that they had found a nice old hollow tree for nesting. Or possibly the empty tank was a fine place to drum upon. But George could not be convinced of this. He often declared that he presumed if the tank had been creosoted that the creosote would merely have been an appetizer for the pesky birds.

After making sure that he had frightened all the yellow-hammers away, George made his way down to the little pump-house beside the right of way and, unlocking the door, went inside. First giving the big gasoline engine an inspection, he oiled all bearings, filled oil cups and then primed the engine by operating the little gasoline pump a few seconds. This done, he threw in the switch and, giving the huge fly wheel a few turns, started the engine. For a few minutes it gave forth reluctant coughs, then becoming warmed up it ran more steadily, exhausting at regular intervals. Slipping on a pair of gloves so as to avoid burning his hands from the friction, George grasped the polished knob that threw in the clutch and started the pump. Everything worked fine and the pump started, throwing a good volume of water from the lake nearby up to the big tank on top of the hill.

When George saw that everything was working all right he went outside and looked towards the pretty little lake from which the company obtained water for their engines. It appeared inviting, so, taking his fish-pole down from under the eaves of the pump-house, George picked up his shovel, dug a can of worms and started for the lake. The engine was running fine and the oil cups full, so it would need no attention for three hours or so, thought George.

Arriving at the place where he usually fished, he baited his hook and threw out. Yes! They were biting! In an hour he had caught fifteen large blue-gills. George was enjoying the sport greatly when someone shouted at him: "Gee! I wish't I was a pumper." Turning, he saw a farmer driving to his work and who had evidently been watching him pull in the fish. "Nothing' to do but to fish,' added the farmer enviously as he leaned on his cultivator handles.

"It's all right—when everything is going all right," shouted back George reservedly.

"I'll trade jobs with you any time," answered the farmer as he drove on. "Just let me know when you want to trade."

"I'll do that," replied George, laughing.

The farmer had hardly disappeared in the corn when George's ears told him that the engine was lagging. A different sound mingled with the exhaust, and after listening a minute longer he laid his pole down and walked back to the pump-house. Going up to the cylinder head, he immediately saw what was wrong. The gasket between the igniter and the cylinder head had partially blown out. Stopping the engine, George took down a pattern from a nail and laying it on a sheet of asbestos he cut out a new gasket with his pocket knife. After doing this he removed the igniter, scraped the old asbestos cleanly off and fitted the new gasket on, being careful not to tear it. This done, he replaced the igniter, tightened the nuts and again started the engine. Being warm, it started very easily, and after seeing that everything was all right George returned to his fishing.

He had pulled out another fine blue-gill and was getting another bite when he heard his engine give a few despondent coughs and stop. Throwing his pole down quickly, he started back for the pump-house. "I wonder what's wrong now," he said to himself as he walked along. Entering the pump-house, he looked the engine over carefully. Apparently not a thing was wrong, so he tried to start it. It started. It ran—for a few seconds. Then it stopped. It died a rather slow death, and George began to seek the cause therefore. He grounded his battery on the engine and obtained a nice big spark. He again took off the igniter and filed the electrodes, being careful to clean them well. In doing this he tore the new gasket he had just made and had to cut out a new one. Then he tried to start the engine. Again it started. Again it ran—for a few seconds. And again it stopped.

George began all over again. He adjusted the gasoline feed. He tested the batteries again. He looked for short circuits. In fact, he did everything that he had ever heard of for making a gasoline engine run. At frequent intervals he tried to start the balky engine. It always started. And also always stopped, after running a few seconds. For three solid hours George worked. He did all the tricks that he knew about to get a gasoline engine running over and over again. It was no use. Apparently it was getting a good spark and a good feed of gasoline, but it would not run for half a minute at a time. Some of the things George did, he did because they were the reasonable things to do—others he did in sheer desperation.

For the tenth time he removed the igniter. It was O. K. He was a fool for looking at it, he told himself savagely. Replacing it, he sat down on the bench in the pump-house and surveyed the balky engine, a deep frown wrinkling his forehead. For perhaps twenty minutes he sat studying the engine. Then—his perplexity as great as ever—he began testing for loose connections. When he happened to take hold of the circuit-breaker, that long copper strip beside the cylinder, it broke off in his fingers. So that was it! Examining it, he found the trouble. It had cracked almost off next to the place where it was attached to the engine, and while some current was able to pass the partial break and thus start the engine, as soon as it began running nicely the vibration cut this down by jarring the broken part so close to the cylinder that the spark jumped across and short-circuited until not enough current reached the electrodes to fire the charge. George replaced the broken circuit-breaker with a new one, gave the fly wheel a few turns, and the engine started off as fine as could be.

"I wish," said George to himself, "I wish that when this beastly engine breaks anything that it would make a good job of it. It would save me a lot of trouble."

When he felt sure that the pump was going to run all right George returned to the lake to get his fish and pole. It was getting late in the afternoon now and he

would have to catch No. 6, the five-twenty passenger train back to Woodville. Bending down to pick up his fish and fish-pole, George stopped as if petrified. Slower—and slower and slower came the exhaust of the engine, and then with one last convulsive cough it died.

We mentioned once before that George was only human. If, after working for four hours on a balky engine you had at last succeeded in finding the trouble and getting it started again, and if, with your hands and face covered with lubricating oil and black grease, you had gone back to get your fishing outfit and to enjoy a few minutes' respite—if after all of this that engine had developed another ailment, what would you do and say? We don't know what you would do, but we do know what George did. When he was sure that his engine had again stopped he deliberately picked up his pole, wound up his line and fastened the hook, then picked up his fish and slowly started for the pump-house. And he did it all in deadly silence. His feelings were too deep for mere words and he felt the futility of attempting to express them. Placing his fish-pole back under the eaves of the pump-house, he entered and again inspected his engine. As usual, everything appeared all right. Turning the fly wheel over, he started it. It ran slowly, then faster and then slowly again. When he attempted to throw the clutch in it stopped, evidently not having enough power to carry the load.

For over half an hour George worked trying to locate the trouble, and then taking off the igniter for the fifteenth time that day he discovered a broken insulation in the body—the engine had been "shorting." He was about to replace this when he heard a train whistle. It was No. 6, the passenger train he was to return to Woodville on, and hastily dropping the igniter on the bench, he grabbed his coat and fish, and quickly locking the pump-house door sped up the stairs to the track and then towards the little flag station where No. 6 picked up passengers on signal. Luckily there was someone to get on besides himself and they had the signal up. George did not have time to get up to the station, but as No. 6 pulled by him he caught the rear coach, which fortunately had the vestibule open. Climbing to the platform, he wiped his greasy face and hands with his bandana handkerchief, and happening to look back towards the corn field beside the lake, he saw the farmer returning home after his afternoon's work. Slowly a broad grin overspread George's face, then he broke into a chuckle and finally burst into a hearty laugh.

"There's that fool that wished he was a pumper." he said.

# High Grade Track Work for an Industry

BY W. F. RENCH

THE BALDWIN LOCOMOTIVE WORKS, at its Eddystone plant near Philadelphia, Pa., is following a standard in the construction and maintenance of the sidings within this yard that is unusual for industrial layouts, in that it is nearly, if not quite, equal to the requirements of main track on many roads. This high standard is believed to be justified by the kind of traffic operating over the tracks, having an especial regard for the stiffness as well as the weight of the newly assembled locomotives manufactured at the works, among which are included practically all the types in use throughout the world. The traffic also is burdened with the continuous operation of fifteen 150-ton switch engines of the six-wheel type and in addition, there are 25 locomotive cranes of from 15 to 40 tons capacity constantly working about the plant, constituting a more severe tax upon the track than any of the other equipment mentioned.

The yard consists of 35 miles of tracks, with over 200 switches, and is laid with 100-lb. rail which is mostly new, although in several instances it was found necessary to install some good relayer rail, owing to a lack of available new material during the period of the war. The tracks are almost entirely on curves, which range as high as 16 deg., this having been found to be the maximum that will afford safe passage for all the various types of locomotives constructed at the plant and required to move over the tracks. Many of these locomotives are of the 2-10-2 type, which are especially difficult to operate on sharp curves. Recently a Mallet engine for the Norfolk & Western of the 2-8-8-2 type and having a total length with tank of 100 ft. has been passed through these curves successfully. The curves carry superelevation, although the tendency of late years has been toward a reduction in its amount, and the maximum now permitted is 2 in., although even this limit may be reduced to 1½ in., which is ample for a speed of 15 miles per hour. Care is taken that the change from level to the superelevation of 2 in. is not made in a shorter distance than 50 ft. in any case. The entire elimination of superelevation, a practice favored by the Pennsylvania and other roads for siding operation, is not thought to be feasible in the peculiar service common to this plant.

One interesting feature of this layout consists of nearly 5 miles of track of 24-in. gage on which four 5-ton steam locomotives and two 50-hp. gas locomotives are operated. These narrow gage tracks are laid with 40-lb. rail and include curves with radii as short as 20 ft.

It recently became necessary to install a crossing of one of these narrow gage tracks with a standard gage track in the minimum time. Inquiry developed the fact that it would not be possible to secure a built-up crossing from a manufacturer in less than three months. As a result it was decided to build the crossing in the plant from material on hand. For this purpose a quantity of short rails left over from the construction of the layout supplied the principal item of material. The plates, bolts, braces and even the fillers were found in the scrap bins. By means of acetylene torches it was possible to build up this crossing in 10 days.

The accompanying photograph shows the crossing completed. The standard gage track was on a 32-deg, curve (181-ft. radius), while the narrow gage track was on tangent and the angle of intersection was 12 deg. 50 in. The details of the crossing were as follows:

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|---|---|
| Labor, including foreman | $ 385.80 |
| Burner, including gas | 168.00 |
| Carpenter labor | 33.00 |
| Material at market prices | 676.04 |
| Total cost | $1,262.84 |
| Total weight of crossing | 12 tons |

Another interesting feature in the track layout at this plant is a sand trough stopper for runaway locomotives. While the sand trough itself is in common use for stopping engines and cars after they have been derailed, the peculiar feature of this installation is that the engine is not derailed, but can be moved back to the main track

under its own steam. This is effected by extending the full switch derail as a gauntlet with the main track for a distance of 240 ft., but on a grade 2½ in. below the level of the main rails. The latter detail is accomplished by dapping the ties 1½ in., omitting tie plates and using a rail of ½ in. less in height. The gauntlet distance is 18 in., which allows cross ties to be used. On either side of the gauntlet 6-in. by 6-in. oak timbers are fastened to the ties by boat spikes (screw spikes would probably be better), forming a trough for the sand, which thus lies 2½ in. deep over the top of the gauntlet rails. The timbers on the gage side are placed 5 in. from the gage line; but the outside timbers are set 7 in. from the gage line to avoid their being caught by the counter-weights on the driving wheels. Several tests of this installation have been made and in every case the locomotive was stopped within 100 ft. without being derailed. The necessity for such a provision may be appreciated from the fact that the grade of the first 1,300 ft. above the derail switch averages 1½ per cent and the fall throughout the entire 2,600 ft. of track protected is 30 ft.

A further feature of interest in the maintenance of the sharper curves is the addition of tie rods connecting the two rails at the level of their neutral axis, in somewhat the same manner as is done in girder rail track construction. Holes 1¼ in. in diameter were bored with the torch and 1⅛-in. rods with lock nuts on the outside were installed while the gage of the track was being constantly verified. To avoid the possibility of persons tripping over the rods, a wooden filler piece of gage length and of a depth necessary to reach the roadbed was attached to each rod. It has been found here and elsewhere that the ordinary tie rod engaging only the base of the rail has not proved adequate under the heaviest service, and especially so where the rails are of 100-lb. section and heavier. It is the practice at the Eddystone plant to use tie rods judiciously, some curves being maintained with the rods only at the joints, while at other places as many as five per rail length are required.

At all crossings throughout this plant there is an additional tee rail along the edge of the paving to furnish a permanent flangeway for the traffic. This has proved to be economical in the use of plank and also more sightly, as the ragged appearance of most flange plank is well known. The addition of a guard rail in advance of some of the switches is a not infrequent means in this layout of preventing the high side point receiving the full thrust from the long locomotives, while a simple but effective switch point hold-down is employed at several other places. The type of switch in use here has a flat bar of iron for the connecting rod, which tends to bend upward and allow the switch point to rise. A 2-in. bar across the top of the switch rod, just far enough inside the point to be well clear of the lug and secured to the two adjacent ties, holds the rod down and with it the switch point. Lubrication is necessary in order that the switch can always be thrown readily.

**Hoisting Assembled Crossing into Place**

The organization for maintenance, which is under the direction of the plant engineer, consists of a supervisor of track, a general foreman and five repair gangs, two of which are frequently used on new construction. By reason of the newer portions of the yard being on made ground, considerable surfacing is necessary, which generally consists of the raising of tracks out of face to stakes set by the engineers. This is resulting in a constantly increasing depth of ballast beneath the ties, which at the time the tracks were originally laid was not less than 6 in. The line is maintained by means of center stakes throughout the trackage.

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NEW LINE COMPLETED.—The San Diego & Arizona, a 148-mile line extending east from San Diego, Cal., to El Centro, was formally opened November 16 with the driving of a gold spike by the president, John D. Spreckels.

# WORKING RULES FOR MAINTENANCE MEN FIXED

## Railroad Administration Puts Into Effect Elaborate Regulations Governing Working Conditions

A NATIONAL agreement covering rules and working conditions for employees represented by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers has been signed by the director general and the officers of that organization, effective December 16, and to continue in force during the period of federal control. The request for revised rules and working conditions for these employees was made ten months ago and has since been under consideration by a committee representing the regional directors and the employees and by the Board of Railroad Wages and Working Conditions.

The text of the agreement is as follows:

ARTICLE I—SCOPE.—These rules govern the hours of service and working conditions of all employees in the maintenance of way department (not including supervisory forces above the rank of foremen and not including the signal, telegraph and telephone maintenance departments), shop and roundhouse laborers (including their gang leaders), transfer and turntable operators, engine watchmen, pumpers and highway crossing watchmen, except the following:

a. Employees provided for in the national agreement with the mechanical crafts, dated September 20, 1919.

b. Clerical forces and other employees provided for in Articles I and II, Supplement No. 7, General Order No. 27.

c. Boarding car and camp employees provided for in Supplement No. 18, to General Order No. 27.

They supersede all rules, practices and working conditions in conflict therewith.

It is understood that this agreement does not annul agreements already in effect with other organizations unless and until a majority of the employees concerned express a desire for a change.

ARTICLE II—SENIORITY.—(a) Seniority begins at the time the employee's pay starts.

(b) Rights accruing to employees under their seniority entitle them to consideration for positions in accordance with their relative length of service with the railroad, as hereinafter provided.

(c-1) Seniority rights of all employees are confined to the sub-department in which employed.

(c-2) Except as provided in Section (d) of this article and in Section (h), Article III, when force is reduced the senior men, in the sub-department, on the seniority district, capable of doing the work shall be retained.

(d-1) Seniority rights of laborers, as such, will be restricted to their respective gangs, except that when force is reduced laborers affected may displace laborers junior in service on their seniority district.

(d-2) Seniority rights of laborers to promotion will be restricted to the territory under the jurisdiction of only one supervisor or other corresponding officer, except that for laborers in the mechanical department, such rights will be confined to the place where employed.

(e) Seniority rights of employees of higher rank than laborers to new positions or vacancies will be restricted to the territory over which one superintendent, one division engineer, or one master mechanic, has jurisdiction. When force is reduced, foremen will have the right, before displacing other employees, to displace only foremen with the least seniority rights on their respecitve seniority districts.

(f) Employees assigned to temporary service may, when released, return to the position from which taken, without loss of seniority.

(g) Seniority rosters of employees of each sub-department by seniority districts will be separately compiled. Copies will be furnished foremen and employees' representatives and be kept at convenient places available for inspection by employees interested.

(h) Seniority rosters will show the name and date of entry of the employees into the service of the railroad, except that names of laborers will not be included and their seniority rights will not apply until they have been in continuous service of the railroad in excess of six months.

(i) Rosters will be revised in January of each year and will be open to correction for a period of 60 days thereafter.

(j) Employees given leave of absence in writing by proper authority of the railroad, for six months or less, will retain their seniority. Employees failing to return before the expiration of their leave of absence will lose their seniority rights unless an extension has been obtained.

(k) When employees, laid off by reason of force reduction, desire to retain their seniority rights, they must file with the officer of the sub-department notifying them of the reduction, their address, and renew same each 60 days. Failure to renew the address each 60 days or to return to the service within 7 days after being so notified, will forfeit all seniority rights.

(l) Employees temporarily transferred by direction of the management, from one seniority district to another, will retain their seniority rights on the district from which transferred.

(m) In case of change in seniority districts, a relative proportion of the total employees affected will be transferred to and their seniority rights adjusted in the revised districts by the management, with a properly constituted committee representing the employees.

(n) Employees accepting positions, in the exercise of their seniority rights, will do so without causing extra expense to the railroad, except as provided in these rules.

ARTICLE III—PROMOTIONS.—(a) Promotions shall be based on ability, merit and seniority. Ability and merit being sufficient, seniority shall prevail; the management to be the judge.

(b) In transferring employees to fill vacancies or new positions, the provisions of section (a) of this article will apply.

(c) Employees are entitled to promotion only on the district and in the sub-department, over which their seniority rights prevail.

(d) Employees declining promotion shall not lose their seniority except to the employee promoted and only in the next higher rank of service.

(e) Employees accepting promotion and failing to qualify within 30 days, may return to their former positions.

(f) New positions and vacancies will be bulletined within 30 days previous to or following the dates such vacancies occur, except that temporary vacancies need not be bulletined until the expiration of 30 days from the date such vacancies occur.

(g) Promotions to new positions or to fill vacancies will be made after bulletin notice has been posted for a period of 10 days at the headquarters of the gangs in the sub-department of employees entitled to consideration in filling the positions, during which time employees may file their applications with the officer whose name appears on the bulletin. The appointment will be made before the expiration of 30 days from the date the bulletin is posted and the name of the employee selected will then be announced. New positions or vacancies may be filled temporarily, pending permanent appointment.

(h) The general rule of promotion and seniority will not apply to positions of track, bridge and highway crossing watchmen and signalmen at railway (non-interlocked) crossings, but, when practicable, such positions will be filled by incapacitated employees from any department and preference in filling and retaining these positions will be determined by the degree to which incapacitated for other work, seniority in the service of the railroad and ability to perform the work.

ARTICLE IV—DISCIPLINE AND GRIEVANCES.—(a) Employees disciplined or dismissed will be advised of the cause for such action, in writing, if requested.

(b) An employee disciplined or who feels unjustly treated shall, upon making a written request to the immediate superior within 10 days from date of advice, be given a fair and impartial hearing within 10 days thereafter and a decision will be rendered within 20 days after completion of hearing. Such employee may select not to exceed three employees to assist at the hearing.

(c) A transcript of an employee's evidence, when taken in writing, will be furnished only to such employee upon verifying and signing same.

(d) A copy of all the evidence taken in writing at the hearing will be promptly made available for use of a properly constituted committee, when required in handling cases on appeal, of which notice has been given in accordance with section (e) of this article.

(e) An employee dissatisfied with a decision will have the right to appeal in succession up to and including the highest officer designated by the management to handle such cases, if notice of appeal is given the officer rendering the decision within 10 days thereafter. The right of the employee to be assisted by duly accredited representatives of the employee is recognized.

(f) If the charge against the employee is not sustained, it

shall be stricken from the record. If by reason of such unsustained charge the employee has been removed from position held, reinstatement will be made and payment allowed for the assigned working hours actually lost, while out of the service of the railroad, at not less than the rate of pay of position formerly held or for the difference in rate of pay earned, if in the service.

(g) Prior to the assertion of grievances as herein provided, and while questions of grievances are pending there will neither be a shut down by the employer nor a suspension of work by the employees.

(h) Employees serving on committees, on sufficient notice, shall be granted leave of absence and free transportation, for the adjustment of differences between the railroad and its employees.

ARTICLE V—HOURS OF SERVICE, OVERTIME AND CALLS.—(a-1) Except as otherwise provided in these rules, eight consecutive hours, exclusive of the meal period, shall constitute a day's work.

(a-2) For regular operation requiring continuous hours, eight consecutive hours without meal period may be assigned as constituting a day's work, in which case not to exceed 20 min. shall be allowed in which to eat, without deduction in pay, when the nature of the work permits.

(a-3) Regularly established daily working hours will not be reduced below eight to avoid making force reductions.

When less than eight hours are worked for convenience of employees, or when regularly assigned for service of less than eight hours on Sundays and holidays, or when, due to inclement weather, interruptions occur to regular established work periods preventing eight hours' work, only actual hours worked or held on duty will be paid for except as provided in these rules.

(a-4) Except as otherwise provided in these rules, only the hours between the beginning and release from duty, exclusive of the meal period, shall be paid for.

(a-5) Except as otherwise provided in these rules time worked on Sundays and the following holidays: New Year's, Washington's Birthday, Decoration Day, Fourth of July, Labor Day, Thanksgiving and Christmas, shall be paid for at the pro rata hourly rate when the entire number of hours constituting the regular week-day assignment are worked.

On roads where an agreement or practice more favorable to the employees is in effect such agreement or practice, in so far as it relates to this section (a-5), may be retained.

(a-6) Except as otherwise provided in these rules when assigned, notified or called to work on Sundays and or the above specified holidays, a less number of hours than constitutes a day's work within the limits of the regular week-day assignment, employees shall be paid a minimum allowance of two hours at overtime rate for two hours' work or less, and at the pro rata hourly rate after the second hour of each tour of duty. Time worked before or after the limits of the regular week-day assignment shall be paid for on the actual minute basis at the rate of time and one-half time.

On roads where an agreement or practice more favorable to the employees is in effect such agreement or practice, in so far as it relates to this section (a-6), may be retained.

(a-7) Overtime for laborers in extra or floating gangs whose employment is seasonal and temporary in character, when engaged in work not customarily done by regular section gangs, such as ballasting and rail laying, including the tie renewals incident thereto, and ditching or in improvement work, such as bank widening, grade and line changes. riprapping and similar work, shall be computed for the ninth and tenth hour of continuous service, exclusive of the meal period, pro rata, on the actual minute basis and thereafter at the rate of time and one-half time. Such extra or floating gangs will not be used to displace regular section gangs.

(a-8) Overtime for regular section laborers and other employees except those covered in Sections (a-7) and (a-12) of this article shall be computed after the eighth hour of continuous service, exclusive of the meal period, on the actual minute basis at the rate of time and one-half time.

(a-9) Except as otherwise provided in these rules, employees notified or called to perform work not continuous with the regular work period, will be allowed a minimum of three hours for two hours' work or less and if held on duty in excess of two hours, time and one-half time will be allowed on the minute basis.

(a-10) Except as otherwise provided in these rules, employees will be allowed time and one-half time, on minute basis, for service performed continuous with and in advance of regular work period.

(a-11) Employees who have completed their work period for the day and been released from duty, required to return for further service may, if conditions justify, be paid as if on continuous duty.

(a-12) Except as otherwise provided in this section, positions not requiring continuous manual labor, such as track, bridge and highway crossing watchmen, signal men at railway non-interlocked crossings, lamp men, engine watchmen at isolated points, and pumpers, will be paid a monthly rate to cover all services rendered. This monthly rate shall be based on the present hours and compensation. If present assigned hours are increased or decreased the monthly rate shall be adjusted pro rata as the hours of service in the new assignment bear to the hours of service in the present assignment, except that hours above ten, either in new or present assignments, shall be counted as one and one-half in making adjustments. Nothing herein shall be construed to permit the reduction of hours for the employees covered by this section (a-12) below eight hours per day for six days per week. The wages for new positions shall be in conformity with the wages for positions of similar kind, class and hours of service where created.

Exceptions to the foregoing paragraph shall be made for individual positions at busy crossings or other places requiring continuous alertness and application, when agreed to between the management and a committee of employees. For such excepted positions the foregoing paragraph shall not apply.

(b) No assigned hours will be designated for employees, performing intermittent service, requiring them to work, wait or travel, as regulated by train service and the character of their work, and where hours cannot be definitely regulated.

(c-1) Employees' time will start and end at designated assembling points for each class of employees.

(c-2) The starting time of the work period for regularly assigned service will be designated by the supervisory officer and will not be changed without first giving employees affected 36 hours' notice.

(c-3) Employees working single shifts, regularly assigned exclusively to day service, will start work period between 6 a. m. and 8 a. m.

(a-4) Employees working single shifts, regularly assigned exclusively to part day and part night service, will start work period between 3 p. m. and 6 p. m.

(c-5) Employees working single shifts, regularly assigned exclusively to night service, will start work period between 6 p. m. and 9 p. m.

(c-6) For regular operations necessitating working periods varying from those fixed for the general force as per sections (c-3), (c-4) and (c-5), the hours of work will be assigned in accordance with the requirements.

(d-1) When a meal period is allowed, it will be between the ending of the fourth hour and beginning of the seventh hour after starting work, unless otherwise agreed upon by the employees and employer.

(d-2) If the meal period is not afforded within the allowed or agreed time limit and is worked, the meal period shall be paid for at the overtime rate and 20 min. with pay in which to eat shall be afforded at the first opportunity.

(d-3) Unless acceptable to a majority of the employees directly interested, the meal period shall not be less than 30 min. nor more than 1 hr.

(e) To compute the hourly rate of monthly rated employees, take the number of working days constituting a calendar year, multiply by eight and divide the annual salary by the total hours, exclusive of overtime and disregarding time absent on vacations, sick leave, holidays or for any other cause. In determining the hourly rate, fractions less than one-fourth of one cent shall be as one-fourth of one cent; over one-fourth and under one-half, as one-half cent; over one-half and under three-fourths, as three-fourths; over three-fourths, as one cent.

(f) Employees required by the management to travel on or off their assigned territory in boarding cars will be allowed straight time traveling during regular working hours, and for Sundays and holidays during hours established for work-periods on other days. When traveling in boarding cars after work-period hours, the only time allowed will be for actual time traveling after 10 p. m. and before 6 a. m., and at half-time rate.

(g) No overtime hours will be worked without authority of a superior officer, except in case of emergency, where advance authority is not obtainable.

(h) Employees whose responsibilities and or supervisory duties require service in excess of the working hours or days assigned for the general force, will be compensated on a monthly rate to cover all services rendered, except that when such employees are required to perform work which is not a part of their responsibilities or supervisory duties, on Sundays or in excess of the established working hours, such work will be paid for on the basis provided in these rules in addition to the monthly rate. For such employees, now paid on an hourly rate, apply the monthly rate, determined by multiplying the hourly rate by 208. Section foremen required to walk or patrol track on Sundays shall be paid therefor on the basis provided in the rules, in addition to the monthly rate.

(i) Employees temporarily or permanently assigned to duties requiring variable hours, working on or traveling over an assigned territory and away from and out of reach of their regular boarding and lodging places or outfit cars, will provide board and lodging at their own expense and will be allowed time at the rate of 10 hr. per day at pro rata rates and in addition pay for actual time worked in excess of 8 hr. on the basis provided in these rules, excluding time traveling or waiting. When working

at points accessible to regular boarding and lodging places or outfit cars, the provisions of this rule will not apply.

(j) Regular section laborers required to report at usual starting time and place for the day's work and when conditions prevent work being performed, will be allowed a minimum of three hours. If held on duty over three hours, actual time so held will be paid for.

Employees whose regular assignment is less than three hours are not covered by this rule. (This paragraph is to cover regular assignments such as care of switch lamps or other duties requiring short periods on Sundays or other days for special purposes.)

(k-1) Where special work is done outside of regular work period and extra compensation agreed upon, overtime will not apply.

(k-2) Employees will not be required to suspend work, after starting any daily assigned work period, for the purpose of absorbing overtime.

(l) Gangs will not be laid off for short periods when proper reduction of expenses can be accomplished by first laying off the junior men.

(m) Employees not in outfit cars will be allowed straight time for actual time traveling by train, by direction of the management, during or outside of regular work period or during overtime hours, either on or off assigned territory, except as otherwise provided for in these rules. Employees will not be allowed time while traveling in the exercise of seniority rights or between their homes and designated assembling points or for other personal reasons.

(n) In emergency cases, employees taken off their assigned territory to work elsewhere will be furnished meals and lodging by the railroads, if not accompanied by their outfit cars. This rule does not apply to employees customarily carrying midday lunches and not being held away from their assigned territory an unreasonable time beyond the evening meal hour. This rule will also not apply to employees temporarily transferred under section (1), Article II.

(o) Employees taken away from their regular assigned duties, at the request of the management, to attend court or to appear as witnesses for the railroad, will be furnished transportation and will be allowed compensation equal to what would have been earned had such interruption not taken place and in addition necessary actual expenses while away from headquarters. Any fees or mileage accruing will be assigned to the railroad.

(p) An employee working on more than one class of work on any day will be allowed the rate applicable to the character of work preponderating for the day, except that when temporarily assigned by the proper officer to lower rated positions, when such assignment is not brought about by a reduction of force or request or fault of such employee, the rate of pay will not be reduced.

This rule not to permit using regularly assigned employees of a lower rate of pay for less than half of a work day period, to avoid payment of higher rates.

(q) The pay of female employees for the same class of work shall be the same as that of men and their working conditions must be healthful and fitted to their needs. The laws enacted for the government of their employment must be observed.

(r) Except as provided in these rules no compensation will be allowed for work not performed.

ARTICLE VI—GENERAL.—Section (a) There will be no discrimination on account of membership or non-membership in an association of employees. Employees serving on committees will, on sufficient notice, be granted leave of absence and such free transportation as is consistent with the regulations of the railroads, when called for committee work.

(b) Except for temporary service, employees will not be transferred to another division unless they so desire.

(c) It will be the policy to maintain camp cars in good and sanitary condition and to furnish bathing facilities when practicable and desired by the employees and to provide sufficient means of ventilation and air space. All dining and sleeping cars will be screened when necessary. Permanent camp cars used for road service will be equipped with springs consistent with safety and character of car and comfort of employees. It will be the duty of the foreman to see that cars are kept clean. When necessary, in the judgment of the management, kitchen and dining cars will be furnished and equipped with stoves, utensils and dishes, in proper proportion to the number of men to be accommodated.

(d) The railroad will see to it that an adequate supply of water suitable for domestic uses is made available to employees living in its buildings, camps or outfit cars. Where it must be transported and stored in receptacles they shall be well adapted to the purpose.

(e) Employees will be allowed, when in the judgment of the management conditions permit, to make week-end trips to their homes. Free transportation will be furnished consistent with the regulations. Any time lost will not be paid for.

(f) The railroads will furnish the employees such general tools as are necessary to perform their work, except such tools as are customarily furnished by skilled workmen.

(g) Employees transferred from one location to another, by direction of the management, will be entitled to move their household effects without payment of freight charges.

(h) Employees transferring from one location to another, in exercising their seniority rights, will be entitled to move their household effects without payment of freight charges, only once in each 12 months' period.

(i) Any privileges or practices necessary to meet local conditions and not conflicting with any rules of these articles are not affected.

(j) This schedule of working conditions shall be printed by the railroads and any employee affected thereby shall be provided with a copy on request.

(k) Controversies arising over the application of this schedule of working conditions shall be referred to Railway Board of Adjustment No. 3, in accordance with the provisions of General Order No. 53.

(l) Rates of pay for the employees named herein authorized by Supplements Nos. 7 and 8 to General Order No. 27, including addenda and interpretations thereof, also any new rates which may hereafter be authorized by the director general, shall become part of this agreement and shall remain in effect during federal operation until changed as provided herein.

It is understood that adjustments made by regional directors, under authority of July 9, 1919, in the rates of pay of certain foremen and assistant foremen covered by this agreement, which rates were made to compensate for all services rendered, including overtime, are to be reconsidered by the regional directors and readjustments made, the overtime and other provisions of this agreement to be taken into consideration in making such readjustments and such readjusted rates to be made effective as of the effective date of this agreement.

(m) This schedule of hours of service and working conditions takes effect December 16, 1919, and except as otherwise herein provided there will be no change in it during federal operation until after 30 days' notice has been given in writing by either party to the other.

## WHY PURCHASE JACK HANDLES?

BY WALTER B. TEMPLETON
President, Templeton, Kenly & Co., Ltd., Chicago

IT'S BEEN a good many years since the track jack came into general use; so long, indeed, that we assume as a matter of course that every section has been equipped

**Using a Square Bar in a Round Socket and the Result**

with track jacks for years. The wooden jack handle came with the jack, and through many years of association we have come to assume that the one is as necessary as the other. I am going to question that assumption.

In 1919 one medium-sized railroad bought 840 track jack handles, or at the rate of 1 handle for every 5½ miles of track. If anything, this is less than the average the country over. Yet on this average figure 260,000 odd miles of track in the United States required 44,500 jack handles in 1919. The money paid for handles is simply the beginning of the real economic waste which the purchase of jack handles represents. All these handles have to be loaded, shipped and unloaded and distributed. They must be entered up in many reports. The original cost of these jack handles is an entire waste and it is worth eliminating; and particularly so if the elimination of this waste means really greater efficiency in the work.

As a matter of fact, the use of jack handles means a good many delays to the surfacing gang because the handles are frequently misplaced, or they are lost or buried;

**A Jack with a Square Bar Socket**

or they are forgotten and left at the tool house and the jacks have either to wait for handles or be used with bars, for which they are not adapted.

The frequent shortage of the jack handles in the gang has caused the trackman himself to answer this problem. Many track jacks have been used with lining bars and the photograph shows a jack where the socket has been distorted in this way. Three reasons are given for the use of these square bars in the round sockets of jacks: First, the bar gives a greater leverage and makes the lift easier; second, jack handles are broken or lost, or not shipped promptly from the store department, and a bar is the natural substitute; third, even when the jack handle is somewhere on the job, the bar is usually nearer the jack and easier to find.

Most kinds of wooden handles are hard to keep. They are of value outside of railway work and many jack handles disappear leaving "no trace." The lining bars carried by a track gang are usually stuck in the ground when they are not using them. Jack handles cannot be stuck in the ground and this is why they are harder to find, and lost so easily. With bars always in sight it is easy to see that their use is going to eliminate a good many delays chargeable mainly to lost or mislaid jack handles.

The way the trackman uses the bar for a jack handle is shown in one of the photographs. A track spike is shoved in to make the square bar fit more tightly in the round socket. At best, however, there will be some lost motion here, and the pressure on the socket under the spike soon distorts the socket, and eventually breaks it. Since the bars are so much more convenient to use and give a greater leverage, and since the bars are being used to a considerable extent now instead of jack handles, why not adopt a square socket to fit the shanks of standard steel bars used by the track gang?

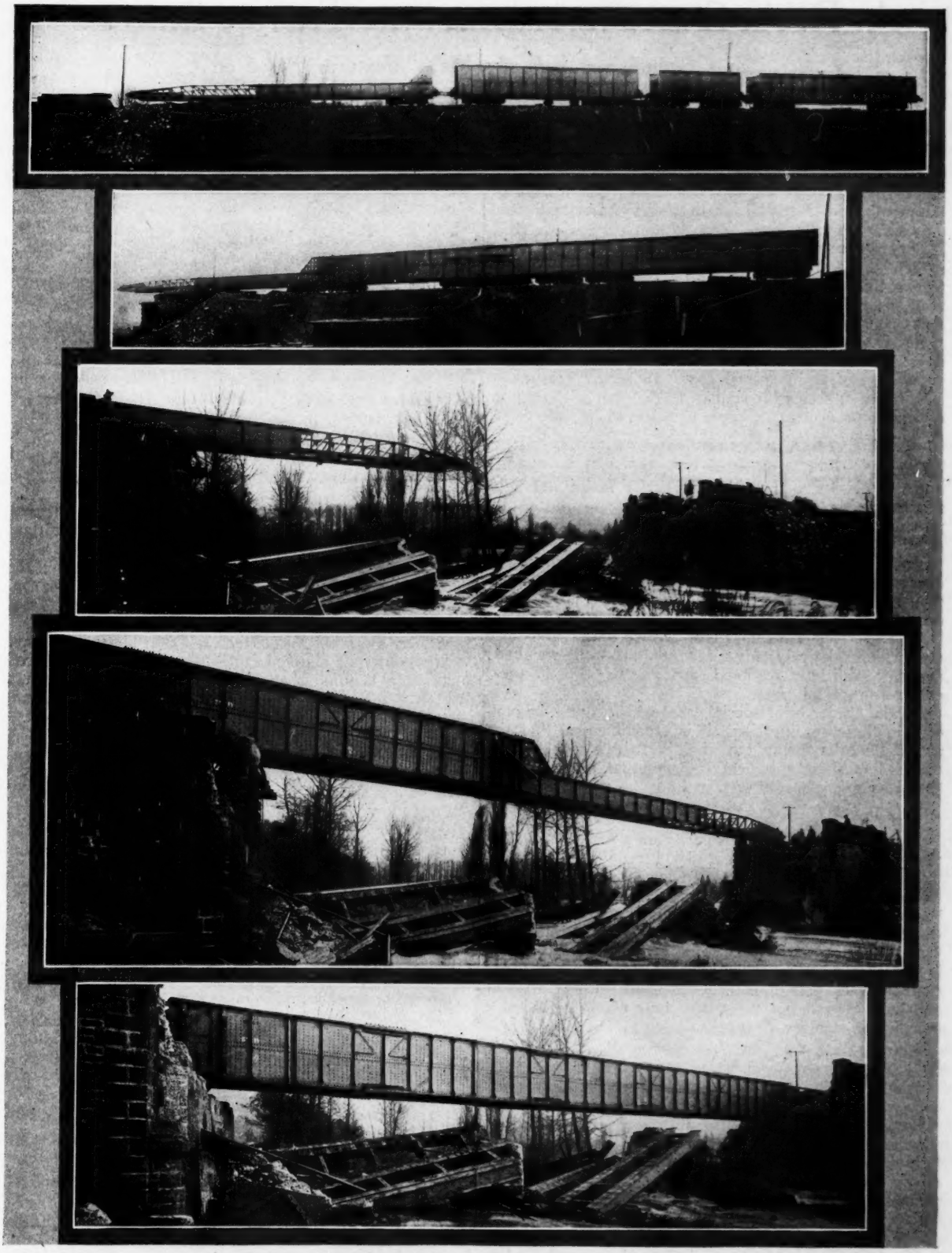
By doing this we eliminate practically all the disadvantages of the old wood jack handle and also prevent the use of the bar in the round socket, which not only results in the injury to the jack, but is likely to cause personal injuries. These injuries come as a result of the bar being loose in the round socket, even with a spike under it, leaving enough lost motion to allow the end of the bar to hit the other rail before the stroke is completed.

## INTERESTING DETAILS OF FRENCH RAILWAY BRIDGE PRACTICE

RAILWAY ENGINEER members of the American Expeditionary Forces were afforded an opportunity to learn many interesting facts concerning the practices of the French with regard to railroad bridges and trestles while serving with our army overseas. In the case of the trestles, European methods are inclined to much greater refinement of workmanship than is the case here. Whereas American practice has been tending toward the elimination of all sizing and fitted joints, the French resort to all kinds of especially fitted connections. For instance, the caps of trestle bents are commonly of two pieces, say 4 in. by 10 in., and the tops of the piles or posts are cut with a central tennon so as to provide a seat for one of the cap pieces on either side. These caps are held in place on the seats thus formed by bolts passing through both the caps and the tennon.

Bridge construction for military purposes has long had a much more intensive study in France than here, and one development along this line which proved of unquestioned value during the war was a form of steel bridge construction developed for rapid erection without the use of falsework. This system was applied both to plate girders and light trusses for bridges having one or more spans of moderate length. As shown in the illustration, this consists of girders arranged with field splices so as to be capable of transportation of convenient length in sections. They are also provided with a light cantilever nose or pioneer section attached to one end, the purpose of which is made clear in an account of the manner of erection.

In applying this construction it is delivered at the bridge site, assembled and mounted on car trucks running on a railroad track that extends to the edge of the bridge opening. The pioneer section is attached to the end nearest the opening to be spanned. The entire structure is then moved forward on the trucks, advancing the nose and a portion of the forward part of the permanent girder over the opening until the nose engages the first intermediate support, where skids or rollers are provided to facilitate further movement while carrying a part of the load. It will be noted that the under side of this pioneer portion has a slight upward curve. This is to allow for the deflection of the projecting portion, and as the structure is pushed further along beyond the first support this upward curve on the nose has the effect of lifting the girder back to a level with the portion still carried on the trucks. The movement is continued in the same manner across the remaining spans until the girder has advanced to the far abutment, after which the pioneer section is removed and the girder lowered to permanent bearings at a suitable elevation relative to the track.



**UNIQUE BRIDGE WORK BY FRENCH ARMY ENGINEERS**

*Beginning at the Top—(1) Girders Delivered on Cars; (2) Assembled and Placed on Carriages; (3) Erection Under Way with Pioneer Section in Advance; (4) Pioneer Section Reaches Opposite Abutment; (5) Girders Lowered Into Place.*

# A. R. A. SPECIFICATIONS FOR TRACK SCALES*

## New Regulations Embody Many Features Based on Studies of U. S. Bureau of Standards

SPECIFICATIONS for track scales have been prepared by a committee representing the American Railroad Association, the United States Bureau of Standards, the Railroad and Warehouse Commission of Minnesota, the National Scale Men's Association and the Scale Manufacturers' Association.

They are intended to apply to knife edge scales of the straight and torsion lever types for weighing cars in regular interchange service. They do not apply to overhead suspended scales, nor to scales now in service, except that reinstallations of old scales should be governed as nearly as practicable by the provisions of the specifications relating to the installation of new scales. They are intended, except in special cases, to secure reasonable uniformity in scales for similar service, but without preventing improvements in types of scales or in scale parts.

### CLASSES OF SCALES

*Character of Classification:* Scales shall be divided into two classes, namely, heavy service scales and light service scales; and except when otherwise specifically provided these specifications are to apply to both classes of scales.

*Heavy Service Scales:* Heavy service scales are those over which a large number of cars are to be weighed; and they shall have sectional capacities of 75 or 100 tons, except for special cases.

*Light Service Scales:* Light service scales are those over which relatively only a few cars are to be weighed; and they shall have sectional capacities of 60 or 75 tons, except for special cases.

*Special Cases:* For special cases which cannot be covered in these specifications, it is recommended that the material, workmanship, etc., shall be at least equal to that required in these specifications, and that the principles herein set forth be followed in so far as they apply.

### CAPACITY

*Capacity Defined:* The capacity of a scale is equal to the weight of the heaviest car it will weigh, provided that the scale will support a train of such cars passing over the scale without stresses being developed in the members of the scale which are in excess of those hereinafter specified.

*Sectional Capacity:* The sectional capacity of the scale is the greatest weight which, if applied on the load knife edges of each pair of main levers, will produce stresses in the scale parts not exceeding those given in the table of working stresses, Section IV.

### PLANS

*Plans:* The manufacturer shall furnish to the purchaser plans of design showing stresses and detailed dimensions for all scale parts, and the material of which they are to be fabricated; also assembly plans showing location of all field connections and all information necessary for the purchaser to design and construct the pit and parts not furnished by the scale manufacturer.

### WORKING STRESSES

The following unit stresses shall not be exceeded when the scale is loaded to its capacity as defined above. These stresses include an allowance for impact caused by moving loads. The strength of each member shall be determined by its weakest cross-section.

*Iron and Steel, Working Stresses in Pounds Per Square Inch:*

| | | | | | Steel for Pivots and Bearings | |
|---|---|---|---|---|---|---|
| Nature of Stress | Cast Iron | Steel Castings | Machinery Steel | Structural Steel | High Carbon | Special Alloy |
| Tension | 1,500 | 8,000 | 8,000 | 10,000 | 24,000 | 30,000 |
| Compression | 8,000 | 10,000 | 8,000 | 10,000 | 24,000 | 30,000 |
| Transverse bending | | | | | | |
| Tension | 2,500 | 8,000 | 8,000 | 10,000 | 24,000 | 30,000 |
| Compression | 8,000 | 10,000 | 8,000 | 10,000 | 24,000 | 30,000 |
| Shear | 2,500 | 6,000 | 5,000 | 7,000 | ..... | ..... |
| Torsion | 2,500 | 6,000 | ..... | 7,000 | ..... | ..... |

The bearing stress on steel pins shall not exceed 15,000 lb. per sq. in.

*Knife Edge Bearing Stresses:*

For heavy service scales the load per linear inch of knife edge shall not exceed 5,000 lb. for high carbon steel or 6,000 lb. for special alloy steel.

For light service scales the load per linear inch of knife edge shall not exceed 6,000 lb. for high carbon steel or 7,000 lb. for special alloy steel.

*Concrete Bearing Stresses:* Stresses to be allowed for bearing on concrete shall not exceed 300 lb. per sq. in. under scale lever stands, and at all other points shall not exceed 400 lb. per sq. in.

*Loops, Formula for Stresses:* Considering the end of the loop as a simple beam, its section at the point of maximum bending shall be determined by the formula $\frac{W}{4}\left[L-\frac{l}{2}\right]$ wherein W equals the maximum load applied to the loop, L equals the distance between the center lines of the depending sides, and $l$ equals the distance over which the load is distributed.

### LENGTH OF SCALE AND NUMBER OF SECTIONS

*Scale Length Defined:* The length of a scale shall be considered as the effective weighing length of the live rails. In no case shall this effective weighing length be greater than the distance between the centers of end sections.

*Scale Lengths Standardized:* The length of scales, except in restricted traffic movements, or for special cases, shall be 50, 56 or 60 ft.

*Number of Sections:* Scales of 60 ft. or less in length shall not be constructed in more than four sections.

*Motion Weighing:* When cars are to be weighed in motion the speed shall not exceed four miles per hour, and each car shall be entirely and alone on the scale a minimum of three seconds. This condition applies to cars normally weighed. When scales are of such a design or length as not to permit of the above condition, cars shall be spotted to secure accurate weights.

### SCALE LEVERS

*Machined Ways for Nose Irons:* Levers that are to be equipped with nose irons shall have those portions of the lever ends receiving them machined for the full distance over which the nose irons are to move.

*Leveling Lugs:* In scales of the straight lever type each lever shall be provided with leveling lugs for longitudinal alignment. In scales of the torsion lever type, leveling lugs shall be provided on the pipe or torsion

*Abstracted from complete specifications.

member for transverse alignment and on the extension arm for longitudinal alignment. Each pair of lugs shall be spaced 11 in. The leveling surfaces of each pair of lugs shall be finished to a common plane which shall be parallel to the plane established by the knife edges of the end pivots.

*Length, Allowable Variation:* All main levers shall be true to within ⅛ in.; and all extension levers shall be true to within ¼ in. of their nominal lengths between the knife edges of end pivots.

*Loading of Levers Other Than Main Levers:* In establishing the load for determining the stresses in the levers other than main levers, it shall be assumed that the end extension levers carry a total live and dead load corresponding to 100 per cent of the sectional capacity; the portion of the middle extension levers carrying the load from the end section only, 100 per cent of the sectional capacity; and the portion of the middle extension levers carrying the combined load from the end section and inner section, 160 per cent of the sectional capacity; the transverse extension lever, shelf lever and beam, 300 per cent of the sectional capacity.

### PIVOTS AND KNIFE EDGES

*Material:* The requirements for physical properties of the steel used for pivots shall be as follows:

*Special Alloy Steel in the Annealed State:*

| | |
|---|---|
| Elastic limit | Not over 75,000 lb. per sq. in. |
| Tensile strength | Not over 110,000 lb. per sq. in. |
| Elongation in 2 in. | Not less than 20 per cent. |
| Reduction in area | Not less than 35 per cent. |

*Special Alloy Steel Hardened:*

| | |
|---|---|
| Elastic limit | Not less than 160,000 lb. per sq. in. |
| Tensile strength | Not less than 200,000 lb. per sq. in. |
| Elongation in 2 in. | Not less than 5 per cent. |
| Reduction in area | Not less than 25 per cent. |
| Shore hardness | Not less than 85. |

*High Carbon Steel in the Annealed State:*

| | |
|---|---|
| Elastic limit | Not over 55,000 lb. per sq. in. |
| Tensile strength | Not over 117,000 lb. per sq. in. |
| Elongation in 2 in. | Not less than 15 per cent. |
| Reduction in area | Not less than 25 per cent. |

*High Carbon Steel Hardened:*

| | |
|---|---|
| Elastic limit | Not less than 135,000 lb. per sq. in. |
| Tensile strength | Not less than 180,000 lb. per sq. in. |
| Elongation in 2 in. | Not less than 3 per cent. |
| Reduction in area | Not less than 12 per cent. |
| Shore hardness | Not less than 85. |

*Design:* All pivots shall be designed and manufactured so that the two sides joining to form the knife edge shall make an angle that will not exceed 90 deg.; that the tolerance for offset of the knife edge of the pivot, as figured from the center line of the pivot at its base, shall be within 10 per cent of the width of the pivot for "machined in" pivots, and 15 per cent of the width of the pivot for "cast in" pivots.

*Machining:* For heavy service scales all pivots of the main levers shall be machined and fitted into machined ways.

*Continuous Contact:* All pivots shall be mounted so as to secure equal and continuous contact of the knife edges with their respective bearings for the full length of the parts designed to be in contact; in loop bearings the knife edges shall project slightly beyond the bearings in the loops.

*Position:* The pivots shall be so mounted that each knife edge in a given lever will be maintained in a horizontal plane under any load; and shall be so mounted that a plane bisecting the angle of a knife edge will be perpendicular to the horizontal plane established by the knife edges of the end pivots, and shall be so mounted that the knife edges in a given lever will be parallel to each other.

*Support for Projecting Pivots:* The reinforcing on the levers to support projecting pivots shall be tapered off to prevent lodgment of dirt next to the pivots and to provide proper clearances.

*Location of Main Lever Load Knife Edges:* The load knife edges of the main levers shall be so located that the center line of the live rails can be placed in the vertical plane established by the centers of those knife edges.

### NOSE IRONS

*Design and Fastening:* The nose irons shall be firmly fastened in proper position by means of screws or bolts of a recognized standard size and thread, or other equally effective mechanical devices.

The means for clamping nose irons in position shall be of such design that indentations in the lever will not be made, and shall be independent of any means provided for adjustment.

The means for clamping nose irons in position shall force or hold them against the lever in the same direction as they would be forced by the load.

The movement of the nose irons shall be controlled by means of adjusting screws of recognized standard size and thread. These screws shall be made of a material which will not corrode.

*Finish and Pivot Mounting:* Those surfaces of the nose irons intended to come in sliding contact with the levers shall be made true so as to secure an accurate fit of the nose irons on or in the levers. Each nose iron shall be of such design that when adjustments are made the knife edge will be held parallel to its original position.

### LEVER FULCRUM STANDS

*Design:* The height of the pillars and the dimensions of the bases of the stands shall be sufficient to prevent a tipping action. In stands of the two-pillar type, both pillars shall be of equal height.

The pillars or upright portions of the stands carrying the bearings shall be so placed on the bases that the centers of the bearing lines shall be over the centers of gravity of the bearing surfaces of the stands.

*Bases for Lever Stands:* The bases of the stands shall be finished to within a tolerance of 1/32 in. or machined when to be mounted on metal bed plates; accurate to a plane perpendicular to the axis of the upright portion of the stand, and the knife-edge bearing line shall be parallel to the surface of the base.

*Pillars, Finish of Tops:* The tops of the pillars for receiving the bearing steels, caps or blocks shall be finished to a tolerance of 1/32 in.

### BEARINGS, BEARING BLOCKS AND LINKS

*Material for Bearing Steels:* The bearing steels shall be equal to or greater in hardness than the knife edges which oppose them. It is found good practice to have the bearing steels not less than 95 points hardness on the Shore recording scleroscope for high carbon steel, and not less than 90 for special alloy steel.

*Design of Bearings:* Scales shall be so designed that, when the load is applied to the live rails, the oscillation of the weigh-bridge will not displace the bearings at points of contact on the knife edges.

*Mounting of Bearing Steels:* All like bearing steels shall be interchangeable or mounted in interchangeable bearing steel blocks. When the steels are separable and interchangeable in the blocks they shall be fastened in position by means of set screws of a recognized standard size and thread, and of a material which will not corrode, or by other equally effective devices.

*Weigh-Bridge Bearings:* The tops of weigh-bridge

bearings making contact with the weigh-bridge girders shall be finished to within 1/32 in. of a true plane that will bring them all to the same height when in position, and in a plane parallel to the bottom of the bases of the fulcrum stands. These tops shall be provided with bolt holes of a sufficiently large diameter to allow for adjustment both transversely and longitudinally to secure a proper alignment of parts.

### LOOPS AND CONNECTIONS

*Design Proportion:* In loops which form bearings for projecting pivots, the radius of the portion of the bearing making immediate contact with the knife edges and the radius of the eye of the loop shall be not less than the length of the longest side of the cross-section of the pivot to be used in the loop.

*Length:* All loops in like connections, except where made adjustable, shall be of the same length.

### CHECKS

*Type:* All weigh-bridges shall be checked by adjustable checks of the rod or other approved type which shall be equal to the rod type in functioning. Both longitudinal and transverse checks shall be provided.

*Number:* Not less than four longitudinal and eight transverse checks shall be provided. When the rod type is used, they shall be assumed to act in tension only.

*Strength:* The combined area in square inches of the check rods at either end or side shall be not less than the sectional capacity in pounds divided by 60,000 when steel check rods are used.

### WEIGH-BEAM AND ACCESSORIES

*Capacity:* The maximum capacity of the beam shall be not greater than 1⅔ times the sectional capacity.

*Full Capacity Beam:* Except for special cases a beam of the full capacity type shall be provided.

*Notches:* The number of notches for the main poise shall not exceed six per inch.

*Registering Beam:* Scales that are to be used exclusively for spot weighing of cars or carload freight shall be equipped with a type registering, or other registering beam, of a capacity that will enable the entire load to be weighed in one draft, and without the use of additional weights of any kind, except for special weighing.

*Fractional Bar Stops:* On registering beams the fractional poise shall be equipped with means to insure a positive stop at any 20-lb. interval, and a stop shall be provided to prevent the movement of the fractional bar beyond its proper travel in either direction.

*Operating Lever:* A substantial double or other approved type of hand grip shall be provided to facilitate the printing or registering of the weight on the ticket with the least possible disturbance of the beam.

*Receptacle for Weight Ticket:* On registering beams means shall be provided to prevent the placing of the weight ticket in its receptacle in any position in which an incorrect weight can be registered.

*Intervals:* The notches and graduations on the main beam shall be made at the thousand-pound intervals.

*Balance Ball:* A balance ball shall be provided and its movement shall be controlled by means of a self-contained hand operated screw or other device which will not require that the ball be rotated in making any adjustments. A means for locking the ball in position shall be provided. The balance ball shall be provided with vertical adjustment.

*Counterbalance Weight:* If counterbalance weights are to be used, the lower end of the hanger stem shall be threaded; a cup for the loose balancing material shall be screwed to the lower end of the stem and each additional weight shall be provided with an elongated hole in the center through which the hanger stem may pass. No slotted counterbalance weights are to be used. When no counterbalance weights are necessary on top of the counterbalance cup the cavity shall be closed by a cover, secured in a positive manner. No counterbalance weights shall be used in any place in the scale, except at the beam.

*Multiplication:* A pivot with a loop shall be provided at the tip of the beam. The multiplication to this pivot knife edge shall be 7,000 or 10,000, which shall be plainly and permanently stamped on the beam.

*Beam Fulcrum Stand:* The beam shall be supported on a stand provided with compensating bearings, and shall not be suspended. The height of the pillars and the dimensions of the base of the stand shall be such as to prevent a tipping action.

The bearing surface of the base of the stand shall be finished to a plane perpendicular to the axis of the upright portion of the stand, and the knife-edge line of the bearing shall be parallel to the base. The center of the bearing line shall be vertically over the center of gravity of the bearing surface of the base.

*Trig Loop:* The contact parts of the trig loop shall be made of a non-magnetic material.

The play of the beam in the trig loop shall be not more than 2 per cent of the distance from the trig loop to the knife edge of the fulcrum pivot.

The beam shall be fitted with a pointer to be used in connection with a fixed graduation or other device on the trig loop to indicate a central position in the trig loop when the beam is horizontal.

### ANTI-FRICTION POINTS AND PLATES

*Required:* Anti-friction points and plates shall be provided to limit the relative lengthwise displacement of all knife edges with respect to their bearings.

*Material:* The anti-friction points and plates shall be made of hardened carbon steel and the plates shall be at least as hard as the points which come in contact with them.

*Clearances:* The clearances between the anti-friction plates and anti-friction points shall not exceed 1/16 in. on the beam, ⅛ in. on the shelf lever, and ¼ in. on all other levers, and the minimum clearances shall be not less than one-half these amounts, respectively.

### CLEARANCES

The clearance around and between the fixed and live parts of the lever system of a scale shall be at least ¾ in except at points where other clearances are specified.

### FACTORY ADJUSTMENTS

*Levers:* The design, workmanship and factory adjustment of the levers and beam shall be such that the proper ratio of the lever arms will be maintained.

*Beams:* Each notch in the beam shall be adjusted to within .002 in. of the nominal distance from the zero notch.

### INTERCHANGEABILITY

Like parts of all like scales of the same design and manufacture shall be interchangeable unless otherwise herein specified. The scale drawings and the parts of the scale shall be marked to indicate the proper positions of the parts in the scale, so as to prevent parts not symmetrically designed being incorrectly placed when the scale is set up.

### SENSIBILITY RECIPROCAL

*Definition:* The sensibility reciprocal shall be that weight required to be added to or removed from the live rails to turn the beam from a horizontal position of equilibrium in the center of the trig loop to a position of equilibrium at either limit of its travel.

*Value:* The sensibility reciprocal shall not exceed 50 lb. in any case.

TOLERANCE

The manufacturers' tolerance to be allowed on the first field test, after installation corrections, of all new railroad track scales shall not exceed 1/20 of 1 per cent, or 50 lb. per 100,000 lb., for any position of the test car load on the scale. The minimum test car load to be applied shall be 30,000 lb.

SCALE WEIGH-BRIDGES

*Type of Girders:* In scales of more than two sections, weigh-bridge girders may be either of the continuous type or the non-continuous type, but non-continuous girders of such design of joints over centers of bearings as will admit of flexure vertically without derangement of sections are recommended.

*Steel Specifications:* Structural steel work shall conform to the specifications of the American Railway Engineering Association.

*Bracing:* Each weigh-bridge span shall be designed for a lateral force of 200 lb. per lin. ft. plus 4 per cent of the sectional capacity of the scale, applied at the top of the live rail and uniformly distributed.

*Diagonal Bracing:* Diagonal bracing shall consist of not less than 3-in. x 3-in. x ⅜-in. angles and not less than three diagonals per span shall be used, or the equivalent of this bracing shall be employed.

# Laboratory Tests on a New Spike

TESTS OF AN entirely new design of track spike made in comparison with parallel tests of common cut and screw spikes afford some interesting food for thought for those maintenance of way officers who have seriously considered the shortcomings of the cut spike, but who have hesitated to advocate the radical change to the screw spike. This new spike is known as the Sessler grip spike, manufactured by the American Spike Company of New York City. As shown in the accompanying drawing this spike has a grooved shank and a round head not unlike that of a screw spike with the nut portion removed. The grooves in the shank, which are of a peculiar shape as shown in the cross section on

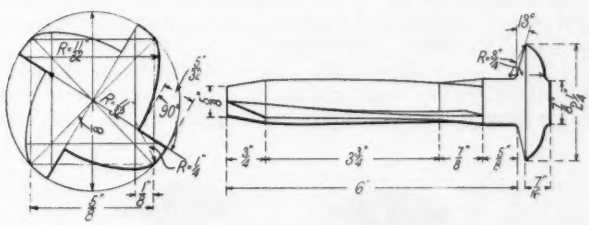


**Fig. 1. Details of the Sessler Grip Spike**

the illustration, have a slight twist so that the spike revolves slightly in driving and drawing. The spike is driven in a manner similar to the ordinary cut spike.

This spike and some cut spikes and screw spikes were subjected to a series of tests at Columbia University, New York, which were recently made public in Bulletin No. 1 of the Civil Engineering Testing Laboratories of Columbia University, under the authorship of Albin H. Beyer and William J. Krefeld. The following is an abstract or synopsis of this report:

The spikes were investigated for resistance to direct pull and resistance to direct pull as affected by redriving. The spikes tested were: (A) A chisel-pointed cut spike furnished by the Pennsylvania Lines with a shank 6 in. long and 21/32 in. square in section, the average weight being 0.81 lb. per spike; (B) a standard screw spike submitted by the Delaware, Lackawanna & Western with an average weight 1.31 lb.; (C) the Sessler spike, which had an average weight of 1.1 lb. per spike.

The ties used in these tests were furnished by the various railroads and represent average quality. They included untreated chestnut, and white oak ties sawed on two sides, an untreated white oak hewn tie, untreated Douglas fir ties sawed on four sides, and creosoted yellow pine ties sawed on two sides.

The pulling tests made to determine the holding power of the three kinds of spikes were conducted under the following conditions:

(*a*) 4 Pennsylvania cut spikes driven 5½ in. without bored hole;
(*b*) 4 Pennsylvania cut spikes driven 5½ in. into ½-in. bored hole;
(*c*) 4 D. L. & W. screw spikes screwed 6 in. into ⅝-in. hole;
(*d*) 4 D. L. & W. screw spikes driven 6 in. into ⅝-in. hole;
(*e*) 4 Sessler Grip spikes driven 5½ in. without bored hole;
(*f*) 4 Sessler Grip spikes driven 5½ in. into 7/16-in. bored hole.

All cut and Sessler Grip spikes were driven by a man inexperienced in track work. The screw spikes were inserted in accordance with the personal instructions of W. L. Madill, roadmaster on the Lackawanna at Hoboken, N. J. One set of screw spikes in each kind of tie was driven for the full 6-in. depth to determine also the effect upon the holding power of driving as compared with the standard method of screwing the spike in.

METHOD OF TESTS

All tests were made in the civil engineering testing laboratory at Columbia University. The tie, with the spikes to be tested facing downward, rested upon two steel blocks upon the upper head of a 100,000-lb. Riehle testing machine. The spike was gripped by means of a special holder forged in the form of a closed yoke and provided with a slot of width just sufficient to engage the shank of the spike below the head.

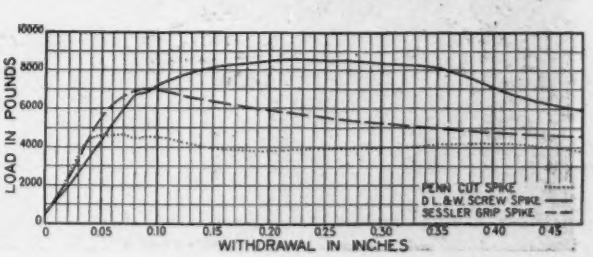



**Fig. 2. Direct Pull Test in a Treated Yellow Pine Tie**

*Cut Spike and Sessler Spike Were Driven into Holes 5½ in., Screw Spike Was Screwed into Hole 6 in.*

For purposes of comparison the resistances of the spikes as they were pulled were tabulated for definite amounts of withdrawals and these were used for the plotting of curves of which the one in Fig. 2 is typical, except that in cases where the screw spikes were driven all or part way instead of being screwed into place the holding power was not nearly so large. In the case of white oak

ties the resistance obtained for all of the spikes was much greater than in yellow pine, reaching about 12,000 lb. for the Sessler spikes and 16,000 lb. for the screw spikes. One phenomenon of these tests as illustrated in Fig. 2 is that, within the limits within which the withdrawal is approximately proportional to the load, the withdrawal for both the cut spike and the Sessler spike is proportionately less for a given load than it is for the screw spike.

### REDRIVE AND PULLING TESTS

In accordance with the suggestion made by the engineers of several eastern railroads, redriving and pulling

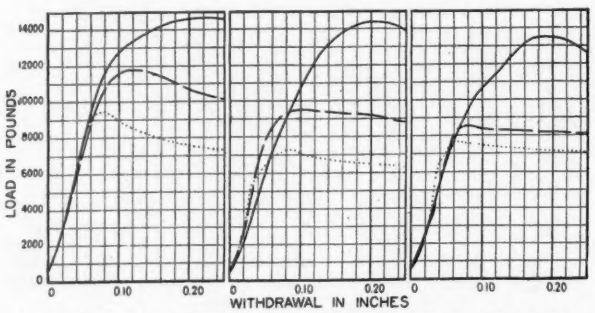



**Fig. 3. Re-pulling Test in an Untreated White Oak Tie**
*Cut Spike and Sessler Spike Were Driven into Holes 5½ in. Screw Spike Was Screwed into Hole 6 in.*

tests were made to determine the effect of the successive redriving of a spike after having been withdrawn 0.25 in. It is believed that such tests will give some information as to the influence upon the holding power of the spike when redriven after having been lifted in service. Six such tests were made for each type of spike in each of the four kinds of ties.

The method of testing was similar to that in the direct pulling tests, except that the spikes were withdrawn only ¼ in. The cut spike and the Sessler Grip spike were then redriven, and the screw spike rescrewed the full amount of the withdrawal in all cases. The spikes were then repulled ¼ in., redriven or rescrewed, respectively, and again repulled ¼ in.

The results obtained from these redriving and repulling tests were computed and plotted in the same way as those for the straight pulling tests and in the same manner Fig. 3 shows an example of the curves obtained in these repulling tests for the spikes in an untreated white oak tie. These curves show higher values by over 100 per cent than those obtained in the treated yellow pine ties and also evidence a considerably greater difference between the screw spike and the Sessler spike than was obtained in the case of the pine ties.

### RELATIVE ULTIMATE HOLDING POWER

The relative ultimate holding powers of the three types of spikes tested expressed in terms of the cut spike driven without a hole for the various ties is as follows:

| Tie | Method of Driving | Cut | Screw* | Sessler Grip |
|---|---|---|---|---|
| Chestnut | Without hole | 100 % | | 139.5% |
| | With hole | 95.2% | 176.6% | 118.5% |
| Creosoted Yellow Pine | Without hole | 100 % | | 142.1% |
| | With hole | 96.9% | 175.2% | 134.1% |
| White Oak | Without hole | 100 % | | 114.3% |
| | With hole | 97.6% | 172.7% | 130.8% |
| Douglas Fir | Without hole | 100 % | | 121.4% |
| | With hole | 82.7% | 167.4% | 107.5% |
| Average, all woods | Without hole | 100 % | | 129.3% |
| | With hole | 93.1% | 172.9% | 122.7% |

*Screw spike screwed full depth.

These results appear to indicate that both the cut and the Sessler Grip spike develop a slightly higher initial resistance to withdrawal when driven without a pre-bored hole than when driven into ½-in. and 7/16-in. holes, respectively. This increase in initial holding power secured when a spike of this type is driven without preforming the hole is of doubtful value; for the efficiency and ultimate life of a spike in a tie depends not so much upon the ultimate initial resistance to withdrawal as it does upon the range of elastic behavior of the wood fibers, provided the friction between the wood fibers and the surface of the spike is sufficient.

A cut spike driven into a tie without first pre-forming the hole crushes and bunches the fibers over a wide area due largely to the splitting and wedging action being confined to one plane. With the Sessler grip spike, this splitting action appears to be less, due partly to the shape of the point tending to produce a combined cutting and splitting action, but much more to the rotation of the spike on driving, averaging 63 deg. when driven without a hole and 68 deg. when driven into a hole.

When a spike is driven into a tie the fibers of the wood are forced downward and pressed simultaneously out-

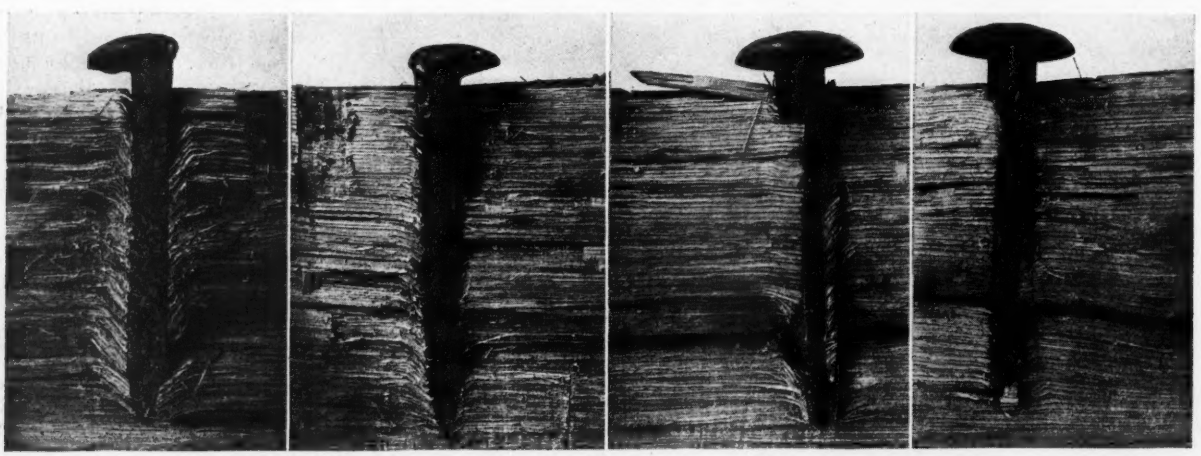


**Fig. 4. Driving Spikes in Pre-formed Holes Lessens Destruction of Wood**
*Left to Right, Cut Spike Without Hole, Cut Spike With Hole, Sessler Spike Without Hole, Sessler Spike With Hole.*

ward. When such a spike fastening is subjected to a direct pull, within its elastic range, the friction between the wood fibers and the surface of the spike tends to hold it in place and whatever yielding does take place is due solely to the elastic distortion of the wood fibers. The elastic withdrawal limit of a spike fastening is reached either when the wood fibers in contact with the surface of the spike are strained beyond their elastic limit, or the bond or adhesion between the fibers of wood and the surface of the spike is insufficient to prevent relative motion between the two. Both in the cut and Sessler Grip spike failures appear to take place simultaneously in the two ways just described. In the screw spike, on the other hand, failure is more gradual, but incipient failure takes place at very low loads, probably due to the crushing of the fibers against the thread of the screw.

When the load upon a spike exceeds its elastic withdrawal limit, sliding friction comes more and more into play and the permanent sets become appreciable. The ultimate resistance to withdrawal that is actually developed by a spike depends somewhat upon the elastic strength of the wood fibers, but much more upon the friction of the bunched and distorted fibers upon each other and the surface of the spike; the amount of friction varies in very wide limits even in the same tie.

To determine the true elastic behavior of three kinds of spikes, a limited number of tests were made in which the withdrawal of spikes was measured directly to the nearest one ten-thousandth part of an inch. In this investigation a creosoted yellow pine tie was used and two spikes of each type were tested, using pre-bored holes. The results of these tests are given in Fig. 5. Based on these results the relative average elastic limit, taking the cut spike as 100 per cent, is 90 per cent for the elastic limit in bearing of the screw spike, 178 for the final yield point of the screw spike and 129 per cent for the Sessler spike.

The behavior of the screw spike as already mentioned is somewhat peculiar; at about 2,700 lb. the true elastic

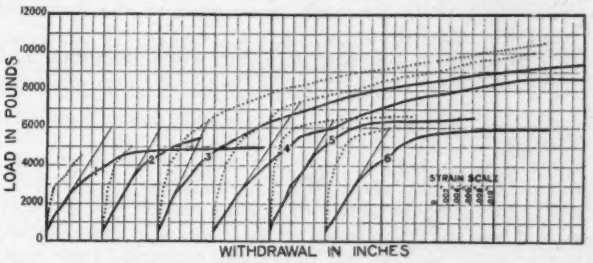



**Fig. 5. Relation Between Applied Load and Corresponding Withdrawal and Set**

*1 and 2—Cut Spike, 3 and 4—Screw Spike, 5 and 6—Sessler Spike. Full Line Is Strain Curve, Dotted Line Is Set Curve.*

limit is reached, evidently due to a bearing failure of the thread upon the wood, represented by the lower percentage in the above table. From this point up to about 5,000 lb. the load strain curve is still substantially straight, but slightly more inclined. At this upper limit, represented by the higher value in the above statement, there is a decided change in direction, increasing rapidly with the load, practically a yield point.

# An Unusual Water Station Development

BY C. R. KNOWLES,
**Superintendent of Water Service, Illinois Central, Chicago**

DURING THE PAST season the demand for an increased supply of water at one of the most important stations on the Illinois Central led to the development of a unique plan for its collection and storage. Under this arrangement water is pumped from a creek ½ mile away into a reservoir with a limited drainage area so that the reservoir may supply water during the time of the year when this creek does not afford an adequate supply. This arrangement has been found to be much cheaper for this location than one involving the development of a reservoir with sufficient drainage area to insure the required quantity of water.

This station is located on the main line of the Illinois Central 270 miles south of Chicago and on account of the heavy business handled over this portion of the line is one of the most important outlying water stations on the system. The water supply was originally secured from Little Muddy creek, whence the station takes its name. This creek furnished but little water during the summer months and an auxiliary supply was secured by constructnig a dam across a small ravine along the right of way and just north of the creek.

On account of increased business and a heavier demand for water it was found necessary to increase the water supply again in 1903, and this was accomplished by constructing an additional reservoir by damming up a valley about 2,000 ft. from the right of way and 2,400 ft. from the pumping station, the water flowing by gravity from the reservoir to the pumps through a six-inch pipe line. On account of the limited water shed available it was found difficult to fill this reservoir even during the rainy season, so the creek was depended upon for the principal supply, as there was ample water in the creek for about six months of the year.

Owing to the extraordinary increase of business through this territory during the past few years the demand again outgrew the supply and the old pumping station was found inadequate to handle properly all the water required. Plans were prepared for a new pumping station and an additional storage tank, together with a 10-in. line to replace the 6-in. line from the reservoir to the pumping station, and relocate the water column serving the northbound main at a total expense of approximately $30,000.

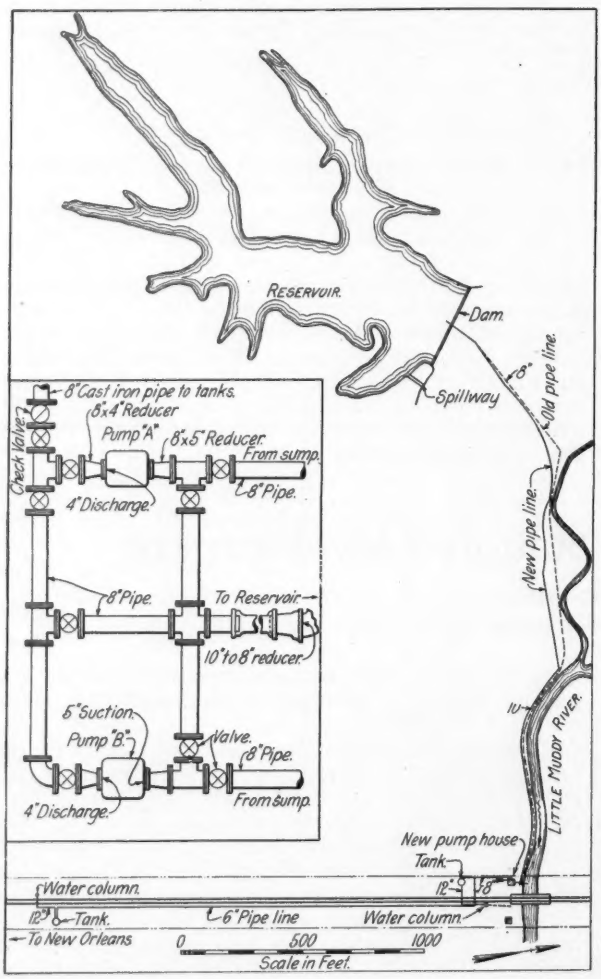
The question of increasing the water supply proved to be a more serious matter, however, as an adequate storage reservoir, together with the required water shed, would mean an expense of between $100,000 and $150,000, as after a thorough investigation it was found that the only way in which sufficient water could be collected and stored from rainfall and runoff was by constructing a second dam across the main valley below the old reservoir and the purchase of a large tract of land for a reservoir site.

In working up the plans for the new pumping station the idea was conceived that this expense could be avoided by designing the pumping equipment and piping arrangement so that the existing reservoir could be filled from the creek when such supply was available, thus always having a reserve supply of 50,000,000 to 60,000,000 gal. to draw upon when the creek failed.

The pumps, being duplicate units, were connected up

in such a manner that one or both pumps can be used to fill the reservoir from the creek. This piping arrangement is such that one pump can supply the tanks while the reserve unit is being used to fill the reservoir; thus the expense for pumping to the reservoir is only the cost for fuel, as no additional attendance is required. When the tanks are filled both units may be used to pump into the reservoir, although the pumping cost is slightly greater when both units are used on account of the increased head due to friction.

The head on the reservoir line when pumping with one unit only is 16 lb. per sq. in., while the head pumping




**Layout of the Little Muddy Water Station and the Piping Arrangement**

with both units is 18 lb., the pumping head on the roadside tanks being 33 lb. The cost per 1,000 gal., for fuel only, in pumping to the reservoir with one unit is 0.4 cent, while the cost using both units is 0.5 cent. It is possible to pump 400,000 gal. to the reservoir in eight hours with one unit, while 500,000 gal. may be pumped by using the second unit after the roadside tanks are filled, the average cost of pumping to the reservoir being approximately 0.42 cent per 1,000 gal.

This arrangement has worked out very satisfactorily and when it was found necessary to discontinue pumping from the creek on September 1, the reservoir was full. This represents a supply sufficient for four or five months, or enough to take care of the demand during the longest dry season. Approximately 30,000,000 gal. of the water in storage was pumped from the creek by the new plant at an expense not to exceed $150, while if additional storage and water shed had been provided the interest and depreciation expense at 6 per cent would have been from $6,000 to $9,000.

The pumping plant is a complete new installation with two 25-hp. horizontal semi-Diesel type engines operating on fuel oil of from 28 to 32 deg. Be., each engine being equipped with a clutch and driving pulley connected direct to shaft of engine. The pumps are four-inch, double-suction, split-case centrifugal pumps with a capacity of 500 gal. per min. against a maximum head of 100 ft. and are belt driven from the engines. The engines run at a speed of 325 r.p.m. and the pumps at 1,300 r.p.m. The water from the creek is pumped from a standard intake sump provided with 14-in. intake lines from the creek through which the water flows by gravity. Each pump is provided with separate 8-in. suction lines from the sump and is also connected to the 10-in. line from the reservoir. This 10-in. line is used as a discharge line when pumping from the creek for storage and as a suction line when pumping from the reservoir to the roadside tank. The plan shows the piping and valve arrangement.

The installation of the oil units with larger pipe lines and increased storage has permitted of operating this station with one eight-hour shift, as compared with three eight-hour shifts with the old station.

The pump house is 25 ft. by 25 ft. inside and is constructed of brick, the pumps and engines being on different levels to permit of placing pumps within a minimum suction lift from the creek. The storage tanks are at the same elevation and are supplied through eight-inch cast-iron mains. The engines and pumps were designed and built by Fairbanks, Morse & Co., Chicago, and the complete installation was made by the Railroad Water & Coal Handling Company, Chicago.

## PROGRESS ON ALASKA RAILROAD

NEW FACTS on the progress and cost of the Alaska Railroad were brought out in recent hearings in Congress. According to reports and testimony presented it was shown that track is now in place on the main line from Seward, the southern terminus, northward for a distance of 227.4 miles. This includes the 71 miles of the Alaska Northern purchased by the government for $1,157,839 and rehabilitated for $1,883,868. In addition there has been completed 48 miles of line southward from Nenana on the Tanana river and 17.2 miles westward from Fairbanks, while 7.4 miles of the Tanana Valley Railroad, a narrow gage line also purchased by the government, has been changed to standard gage. This gives a total mileage of main line track of 292.7 miles, to which must be added the Matanuska branch with 37.7 miles. This leaves a gap of 100 miles in the line between the work projected northward from the seaboard and the work which has been prosecuted in the interior of Alaska.

The most expensive work is between Kern creek and the end of the Seward division, a distance of about 9 miles, with an average cost per mile of $234,000. This involved heavy rock excavation and the construction of snow sheds. The figures given for other stretches of 13 to 37 miles each were $67,100, $44,400, $62,100, $48,500 and $62,300. These figures cover a portion of the line from Kern creek northward to the Susitna river crossing and also the Matanuska branch.

The most formidable bridge work involved in the project is a bridge over the Tanana river at Nenana. This will consist of one 200-ft. steel lift span and 10 fixed spans, of which there are 2 of 350 ft. and 8 of 56 ft. The estimated cost of this phase of the project is $1,300,000.

# THE MAINTENANCE OF WAY PAINTERS' CONVENTION*

## Shortage of Painters and Need for Vocational Training and Labor-Saving Equipment Are Discussed

HOW BEST TO overcome the prevailing shortage of first-class painters and obtain an increased production of high class work from the men now available were the chief subjects of discussion at the sixteenth annual convention of the Maintenance of Way Master Painters' Association of the United States and Canada, which was held at the American hotel, St. Louis, Mo., on October 21, 22 and 23. As a means to this end labor-saving devices, particularly the paint spray machine, received considerable attention in the course of the deliberations, while the subject of permanent forces the year round and the need of apprenticeship systems or vocational training were also discussed at some length.

The officers of this association during the past year were: President, H. E. Conrad, master painter, Pennsylvania Railroad, Huntingdon, Pa.; first vice-president, H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind.; second vice-president, Ole Stubstad, master painter, Chicago & North Western, Winona, Minn.; secretary-treasurer, F. W. Hager, master painter, Fort Worth & Denver, Fort Worth, Tex.

President Conrad, in his address to the members, referred briefly to the great changes wrought by the coming of peace since the association last assembled. He also touched upon the need for vocational training and called attention to the fact that this was one of the most important subjects to be discussed. Another matter of importance to the association was the question of the date of meeting, which had for several years conflicted with that of the convention of the American Railway Bridge and Building Association, this conflict having been frequently been brought to the attention of the president by persons interested in the work of both societies. The real keynote of the address, however, was the reference to the Plumb plan on which the speaker expressed his views in no uncertain terms. On this the president spoke in part as follows:

### Address of the President

I wish to make an appeal to the members of this association on the subject of loyalty to our employers. At the present time much propaganda is being spread for the Plumb plan of government control and it has many followers among the radical class.

The most ordinary common sense, awakened self-interest and knowledge of human nature and human experience should quickly repudiate the fallacies inherent in this plan. The danger is that public thought will not be quickened to the situation, and through lack of understanding and organization, legislation may be forced through Congress by means of organized political pressure, backed by abundant funds for propaganda and lobbying, which will work irreparable mischief before the public is aroused to the peril. As to the labor unions, they are on trial before the public of this country, and they must cleanse themselves of their anarchistic elements or fall. Therefore, let each and every one of us, who believes in American institutions, in property rights, in orderly government, line up in opposition to those who wish to confiscate our industries and bring about a chaotic state in our government. The apprentice system of producing skilled workmen has about disappeared and it is now up to us to find a way to produce more efficient workmen, as painters of the "old class" are getting very scarce and with the enormous increase in the price of labor and materials we should leave nothing undone to create a body of workmen who know the value of materials and how to use them properly.

### Secretary's Report

The report of the secretary recorded the addition of 15 new members, the reinstatement of one, the suspension of 3 for nonpayment of dues, the death of one and one resignation, making a net gain in membership of 11. The total number of members in good standing is 82. Thirty members were in attendance at the meeting.

Below is given an abstract of the principal papers and committee reports presented, together with a report of the discussions following their presentation.

## TOOLS AND EQUIPMENT NEEDED FOR MAINTENANCE OF WAY PAINTING

By H. B. Wilson

Master Painter, Bessemer & Lake Erie, Greenville, Pa.

The material contained in this paper is based entirely on my own experience in maintenance of way painting and owing to the wide variation in the design of bridges and buildings on different railroads in various parts of the country it is entirely possible that tools and equipment of certain types are used for some work that are not mentioned in what follows. The classes of work for which painting appliances are used may be divided into four divisions: Buildings, tanks, signs and bridges.

### Buildings

Under this head is suggested an outfit suitable for painting the interior and exterior of buildings averaging two stories in height with 8 ft. to 14 ft. ceilings. This includes two 6-ft. step ladders, a set of 24-ft. to 32-ft. extension ladders, a 20-ft. staging ladder 30 in. wide with stiles of 1¼-in. spruce or basswood 7 in. wide at the middle and tapered to 5 in. at the ends, rungs of 1¼-in. ash spaced 14 in. and a floor of ⅜-in. wood strips ¼ in. apart. The rungs should be set low enough in the stiles so that when the floor is in place the stiles will project up ½ in. to keep the tools from rolling off. There should also be a ¾-in. round iron triangle to attach the hoisting tackle at each end, hooks for supporting the staging from the roof and two 2-in. by 4-in. struts with rollers at the end to keep the swing at the proper distance from the building wall. The fall lines should be of 1-in. manila rope, of sufficient length for higher work and equipped with L irons for fastening to the ends of ladders for ridge work. The list also includes adjustable trestles or 7-ft. 6-in. non-adjustable folding trestles. Adjustable planks are also useful, but two or three light planks of the desired length are easier to be had.

The brushes should include one 4-in. flat with 4½-in. stock, one 3-in. flat with 3½-in. stock, one 1-in. oval

*A brief notice of this convention appeared in the November issue, but the complete report could not be given there because of lack of space.

with 2½-in. stock, and two ½-in. soft bristle fitches. For inside work the same equipment will serve except that an 8-in. badger brush may be added for varnishing and a 3-in. flat brush with 3-in. stock set in glue for shellacing. The equipment for calcimining should include a 6-in. to 8-in. flat, square-end brush with 7-in. Russian bristles, a short stocked 2-in. flat brush for stenciling, a straight edge, pencil brushes, etc., and pots.

HANDY OUTFIT.—A very handy outfit to have for general purposes is an old hand bag in which to carry small tools, such as pliers, a screwdriver, a tape line, scissors, straining cloth holders, a stipler, graining combs, an oil stone, a nail set, a small plane, files, a cabinet scraper, cold and cabinet chisels, glazing points and a small assortment of screws and nails.

MISCELLANEOUS TOOLS.—These include the following, some of which will be in constant use and others when occasion demands: A pair of ladder jacks, window jacks, a blow torch, putty knives, scrapers, a bead scraper, a glazing chisel, paint pots, pot hooks, paint ladders, drop cloths, a glass cutter, wiping cloths, safety lines, staging safety sticks, a chair swing, chicken boards, water buckets, scrub brushes, a plaster trowel, a broom, rubbing bricks, strainers and mixing pots.

PAPER HANGING.—For paper hanging there should be a 22-in. by 8-ft. folding board (with a zinc strip for trimmer), a pair of folding horses, 2 pairs of shears (10 and 12 in.), a trimmer, a casing knife wheel, a seam roller, a straight edge for the trimmer, a perforating wheel, a yard stick, a two-foot rule, a plumb bob, a chalk line, an 8-in. wide full-stock, flat, Russian bristle paste brush, glue size pails and a double boiler.

WHITEWASHING.—For whitewashing there should be a hand spray pump, a long and short handled fiber brush (lime will burn the oil from bristle brushes), a 25-gal. mixing container and buckets or pots.

GRAINING—For imitating natural woods by graining in oil or distemper, the average mechanic will use assorted steel combs, graduated rubber and leather combs, a stippler, a blender, sponges, a chamois skin, a blaze stick, over grainers and pieces of muslin. Graining rolls and stencil plates can be used, but these are more for amateurs and their use can easily be distinguished from hand work.

## WOOD OR STEEL TANKS

A tool outfit for a single chair swing includes a ½-in. fall line, a ¾-in. piece of rope tied to a three-foot length of ¼-in. chain with a ring on both ends (one ring for tying to the rope that fastens to the pinnacle and other ring for the block hook), a piece of air hose to rest under the chain at the edge of the roof of steel tanks to keep the chain from slipping on the roof edge, an extension ladder and a single ladder. The tools for cleaning the structure and applying paint include a chipping hammer, a scraper, a wire scratch brush, and the same character of brushes as for exterior station work, except that in the applying red lead an oval answers better.

## SIGNS

The tools for the ordinary painted signs include an ordinary paint brush for the body of the sign, a pencil, a rule, a trysquare and dividers for spacing, a triangle rule for framing the letters and an assortment of small brushes, such as a sword liner, assorted sizes of artists sable hair brushes with square and round points and a one-inch flat badger hair brush for filling in wide staffs.

Signs with painted letters on a smalted body require a smalt shaker made from a baking powder can with holes punched in the lid of the can to apply the smalt, in addition to the tools listed for straight painted signs.

Signs with gold-leaf letters and smalted body require the same brushes and tools as above mentioned, and in addition a leaf roll wheel for applying the leaf and a leaf tip brush for the same use.

The best policy where standard sized letters and numbers are used for station or roadway signs is to use stencils for outlining letters and figures. Steel stencil cutting dies for small letters and numbers are of great value for small lettered work and would soon pay for themselves on roads where many small signs are needed. Stencils for roadway signs made of tin are best for roadway work, but for shop work oiled stencil paper (shellacked after laying out the sign) seems preferable.

For work on fixed roading signs short ladders of desired lengths are generally used, besides rigging devices to clamp or lean against the sign posts.

Other tools required for stenciling roadway signs are pots and brushes for coating preparatory to lettering, a 1¼-in. round bristle stencil brush and a ½-in. bristle fitch for stencil pouncing, pencil brushes for filling in staff holder marks, steel wire clothes pins for holding stencils on unframed surfaces, a flat pan for stencil color, a pot for stencil color stock and waste for cleaning stencils.

## BRIDGES

The five classes of bridges with which we are commonly concerned are viaducts, truss and through truss spans, through and deck girder spans and culverts.

VIADUCTS.—For these at least a 24-ft. staging, or if possible staging long enough to cover the whole bent or tower, should be used, with planks across the ends of staging from one swing to the other. For fall lines use ¾-in. manila for work up to 100-ft. in height and 1-in. lines for higher work. The blocks for fall lines should be wood covered if patent hoisters are not used. The planks used should be of good material with bolts through the ends to keep them from splitting, and where placed from one staging to another should be supported in the center by a line or fall line from work above.

Cleaning tools should include 5 to 10 lb. sledges for jarring loose heavy corrosion, 1¼-in. by 5-ft. steel bars (cold chisel ends) for breaking up heavy corrosion between ties, 8-in. cold chisels, No. 1 engineer's hard hammers for use with cold chisels, chipping hammers, octagonal steel bars ¾ in. by 30 in. long with cabinet chisel cutting ends bent about 15 degrees, 2-in. stiff steel scraping knives, ¼-in. by 10-in. steel rods with tempered screw driver end to dig out rust and dirt from small nooks, fine and coarse wire brushes, pieces of barrel hoop with one end bent ¼ in. for pulling dirt from narrow places, a small hand bellows for blowing out dust and flat dusters.

For applying paint 4-in. flat brushes with 4½-in. stock set in rubber or cement makes a good general brush, using the partly used brushes for leads. A stirring stick is also important.

There are a variety of tools and accessories to be used when occasion demands. Paint pots of thin sheet iron with crimped joints and riveted handles to hold 1½ gal., 5-gal. buckets made as of above for stocking men with paint, bell cord hand lines with a hook on the end for passing small tools, and ½-in. manila lines for juggling planks, transferring falls and general shifting of staging. Assorted lengths of ¾-in. manila lines (15 to 30 ft. long) are useful for hanging plank or swinging staging where it is not convenient to use fall lines.

Other articles for use on a bridge are a strong iron or wood ladder with hooks on one end for getting over the sides of a bridge safely, a 10-ft. pole with a U-shaped hook, a ½-in. round iron 20 in. long with hook bent on one end and handle on other end (for lifting blocks up to release from block or sling), thin sheet-iron barrel cov-

ers, ½-gal. dippers, barrel stirring ladles, a hickory woven basket (for pulling up and letting down tools), ⅜-in. wire slings, ¾-in. manila rope slings, a carbide lamp for dark corners, man help brushes and 12-in. lengths of steel barrel hoops (with wool-covered sheepskin riveted on with hollow rivets for swabbing out narrow places) and a chair swing. Another essential is two six-inch letter signs reading "Workmen Below" to be placed on top of bridges facing each way so enginemen will not use injectors or otherwise endanger men working beneath.

DECK TRUSS BRIDGES.—The same equipment may be used on this class of structure as for viaducts, except that on very wide structures, when painting the underside of floors, it may be necessary to suspend some iron triangles from the center of the deck to support the inner ends of planks extending in from the two stagings along each side of the bridge.

THROUGH TRUSS BRIDGES.—These require some 2-in. round iron hooks, large enough to go over the top chords to fasten fall blocks to. A special L-shaped hook with a ring on one end and a U-hook on the other will be found convenient for suspending falls from inclined end posts.

THROUGH PLATE GIRDERS.—Hooks to go over top flanges for the support of staging will be found useful for painting the outsides of girders as well as the under sides of floor systems. A 4-in. by 4-in. timber may be required, suspended underneath, in a horizontal position along the center line of the bridge as an intermediate support for staging.

DECK GIRDERS.—These require about the same equipment as used for through girders. For solid floor structures 4-in. by 4-in. sticks like those mentioned about may be used to advantage with the addition of eye-bolts at each end for attaching lines.

### IN CAMPS AND PAINT SHOPS

A handy appliance for a camp or a shop is a bicycle tread emery wheel. A portable forge and an anvil also come in handy. The shop should also contain a five or six compartment container for suspending used brushes in oil or turpentine. In cars, pots must be used for this purpose together with another container for cleaning brushes. Motor cars may well be fitted with removable brackets for carrying painters' equipment.

### DISCUSSION

The discussion of this paper trended toward the subject of swinging scaffolds in difficult situations rather than to a consideration of the real subject in hand—the listing of tools required by painters. President Conrad said that rope slings were a source of danger when used under a structure passing railway trains underneath. Failure to coil and tie such ropes carefully has resulted in trains picking up dangling ends and pulling down the scaffolds. C. K. Collenberg (U. P.) called attention of the need in tall buildings, like coaling stations, for the provision of suitable means of attaching scaffolds. Eye-bolts at proper intervals would best serve this purpose. E. E. Martin (U. P.) suggested that a combination of a hook and a chain is a more flexible device for suspending falls than a one-piece hook, as the chain combination can be made to fit various widths of beams, flanges, etc. Mr. Wilson replied that it was not necessary for hooks to be a perfect fit.

**H. E. Conrad**
*President*

## THE GRAINER OF THE PAST AND PRESENT

BY MARTIN KANE

Bridge and Building Master, Delaware & Hudson, Albany, N. Y.

The grainer of the past, if we call him such, was one of the most studious of mechanics and was looked upon as such by the painting craft. He made graining a life study by his collection of all kinds of the choicest woods and imitated them through his genius and love for his work.

The future promises new life to graining. We are now confronted with new conditions, which compel new buildings and alterations of old ones to conform to the many restrictive fire laws in the different localities, compelling the removal of natural wood doors, partitions, sash, etc., and the substitution of steel. This means work for one who is able to imitate natural wood by graining.

We have many old varnished surfaces that have been treated with cleaning. To take off all old varnish by varnish removers is costly and, in fact, impractical in our public railroad stations, where one must contend with a rushing public. Such surfaces (of which there are many) can be treated with economy by sanding them and applying one coat of white lead, thinned with one part of boiled oil and three parts of benzol. This, when well brushed on, will destroy the old varnish and penetrate through to the wood, providing a proper foundation for the second coat of ground tinted color, thinned with oil and turpentine. This affords a surface ready for graining. While the writer admits that the set colors must be followed on most roads, he thinks these standards may often be modified where the foreman painter can show to his superior that he can improve the inside of station buildings, as to economy, durability and appearance by graining and varnishing.

The tendency to-day in office and station building furniture is toward steel products and it goes without saying that graining is the only finish, so we have before us the task of training the new grainer. There is room for him in many maintenance of way painting gangs, and we may see the revival of graining, which was and should be the finest branch of the painting trade.

### DISCUSSION

President Conrad referred to the very high grade graining now being done in finishing the interior of steel cars. T. C. Turney (P. L. W.) stated that he had seen some surfaces finished by some photographic process to give a wood grain effect, but was unable to give any details of the process or any data on the cost as compared to hand graining. He said the results secured were good.

## HOW TO SECURE GOOD RESULTS UNDER EXTREME TEMPERATURE

BY F. C. RIEBOLDT

Master Painter, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.

Paint is a liquid consisting of a vehicle with a pigment in suspension. Of the two materials, the writer is of the opinion that the vehicle is of greater importance, and should we make a comparison I would say that vehicle and pigment are relative to each other, the same as soap and water when cleansing a surface; one cannot do proper cleaning without soap, nor can he do painting with pigment alone, and vice versa. The vehicle in a good oil paint consists mainly of linseed oil; the main functions of the vehicle are to anchor the pigment to the surface coated.

An inexperienced person will advise against painting in zero temperature; ask him why and he will answer that the paint freezes. This contention is wrong. A good oil paint will not freeze; it may jell, but a practical painter can manipulate the paint with turpentine to make a uniform application without any trouble. The turpentine is not injurious, but will evaporate and leave the paint in its natural process.

Linseed oil is elastic, this property enabling the paint made with it to expand and contract; it penetrates the surface coated until the paint becomes oxidized or dry. At low temperatures the paint will not oxidize as readily as in hot weather, and the longer one can hold the paint moist the greater the penetration and the better and more perfect the anchorage, thus eliminating future rupturing. Raw linseed oil should not be used at low temperatures as freely as at high temperatures.

Painting at low temperatures insures against adulterated materials. At a temperature of 25 deg. below zero linseed oil has about the consistency of firm lard; cottonseed oil becomes firm at about 5 deg. above zero; water freezes at 32 deg. above zero; animal fats will congeal at even higher temperatures, so it will be seen that if a paint congeals too freely at a moderately low temperature there is something radically wrong. Since linseed oil will withstand frigid weather better than any substitute material, nothing but pure linseed oil can and should be used for low temperature painting if good results are to be obtained.

The writer painted a depot building some years ago in the northern part of Wisconsin when the thermometer registered 29 deg. below zero at 7 a. m., and obtained good results. No rupture has occurred up to this time and there is no room for criticism. How was this job handled? The weather, excepting its frigidness, was ideal—clear with no white frost or wind. At this particular station we had the interior as well as the exterior to paint, so we worked on the inside until about 10 a. m. and then proceeded to the outside and worked there until 3 p. m., always working with the moving sun. The frigid weather held the paint from oxidizing too freely, thus insuring a good and lasting job.

Painting at low temperatures or in winter months on interiors or exteriors has further advantages from the point of economy as well as for durability and appearance. Travel during the winter months is at low ebb, hence the painter is bothered to a lesser degree by the traveling public. There is little dust and smoke to contend with, no flies, insects, etc., to mar or disfigure the coated surface. Buildings heated with steam or hot water have an even temperature; this is essential in varnishing, thus insuring neat and durable work.

How should we proceed when painting in high temperatures? It is a known fact that the application of paint at 90 to 100 deg. will dry or oxidize in three to four hours, thus permitting poor anchorage and rupturing after one or two top coats have been applied; this cannot be avoided. Raw linseed oil has a tendency to hold back the oxidizing process. Use it in high temperature and also proceed with your painting in the shade when possible.

I do not advocate the use of semi-drying oils, such as cottonseed, fish or soya bean oils, to retard the drying process. They may be the cause of future rupturing of the surface, such as alligatoring. However, this contention may be open to discussion.

In all painting moisture is the greatest enemy the painter has to contend with, and to obtain good results in any temperature, you must be assured that the surface you are coating is not only free from moisture, but also from ice, frost, dust, dirt and scaling particles. Use your good judgment in the use of turpentine, raw or boiled linseed oil and Japan dryer. Get your surface in shape and condition to receive the coatings, and the success of your job is assured regardless of the temperature.

### DISCUSSION

President Conrad said that unquestionably better results were secured in cold weather than in hot, as paint applied in hot weather may blister in a day or so, especially if applied on top of old paint. C. K. Collenburg (U. P.) advocated painting on the shady side of a building whenever possible, as by shifting the work with the movement of the sun. The trouble with painting on a hot surface, he said, was that the paint could be spread too thin. T. C. Turney (P. L. W.) objected to painting in the shade because of the presence of insects in greater numbers. It was his experience that cold weather painting was more durable. Mr. Conrad thought that spring and fall work produced the best results. Ernest Lux (C. R. R. of N. J.) called attention to the fact that winter work outside was very expensive because the men took so much time to get warm.

## KEEP MEN EMPLOYED THROUGHOUT THE YEAR

BY HARRY F. JONES

Master Painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind.

It is impossible to keep practical men by working them six months of the year and laying them off the other six. Under this system we are merely operating a trade school. The men we get are inexperienced. We spend our time during the summer trying to teach them, but some other industry gets the benefit, for when we lay them off in the fall we very seldom get them back in the spring. When the time comes to put on men we open up our trade school again and pay another gang of inexperienced men good wages to teach them the trade.

The problem of arranging the work so as to keep men employed throughout the year would be a very small job for the master painter were he allowed to do so. My system of handling the work is as follows: We do our road work as early in the spring as possible, using motor cars and men enough to finish it in as short a time as possible. Consequently, we do not drag it along in the middle of the summer, using valuable time and weather that should be used to better advantage on other work. After completing the road work we give the steel work the attention it should have. I think steel structures should be taken care of during the warm months of the year. My experience has been that we get better results—a better job of cleaning and longer life of the paint.

After completing the steel I start the station work, doing the exterior work first, leaving interior work wherever possible for winter months, especially all offices, interiors

of shops, etc. During October we take care of all the glass requirements, replacing all broken glass, also reglazing all sash that require it.

The first of the year I make a schedule of the work to be done that year, showing the amount of labor and material that will be required to execute the work we have listed. We have been using this system for several years and I find it much better and more practical than the old way under which we had no system. We get a better class of work at less cost by keeping the men employed throughout the year.

### DISCUSSION

Following the reading of this paper President Conrad went into considerable detail regarding the manner in which he keeps his forces busy in winter. In fact, he employs a larger force than in the summer. His, however, is a special case, as he has a great many more buildings in proportion to the mileage than would be the case on most roads, so that he has a larger proportion of high class interior work to do.

## RESULTS SECURED WITH SPRAY PAINTING

BY H. S. BIRD

Master Painter, Philadelphia & Reading, Philadelphia, Pa.

Spray painting is not of a recent origin. My first experience with it was in 1897. The machine was a rather crude affair, composed of a hand pump for compressing air into a storage tank, a receptacle for mixed paint and a hose with a nozzle attachment. The paint used was rather thin in character; owing to the low pressure obtained with a hand pump the heavier paints could not be used. Two men were required to operate this machine. The spray produced was of a cloud effect and as the operator received a large portion of the spray and inhaled a considerable quantity the results were not at all satisfactory.

The modern spray machine is quite different in construction. It is equipped with power air compressors which provide air at higher pressures and make it possible to use a heavier bodied paint, which is applied with considerable force and in a satisfactory manner. The nozzle or gun can be adjusted to a broad or fine spray, the broad spray being adapted to large flat surfaces. The finer spray can be adjusted to narrow surfaces and deep crevices which cannot be reached with a brush.

Some reports I have received from concerns using spray equipment complain of the heavy bodied paints clogging the nozzle. This may be due to many reasons other than the fault of the equipment. The pigment may not be thoroughly mixed, or an incompetent operator may be at fault.

Spray painting applied by an experienced operator is economical in more ways than one. He is not only able to cover a larger surface in much less time than with brush work, but he has a greater reach, therefore saving in the moving of planks and scaffolds. He is also able to reach inconvenient places, thereby eliminating the erection of special scaffolds or rigging, which would be necessary in brush work. I find in some cases a saving in the labor cost of 80 per cent and in material of 30 per cent. This is no doubt true where a competent operator is employed, but in painting railings or lattice work it is the general opinion that the spray is wasteful of paint. This loss, however, is small in comparison to the saving in the cost of labor.

As to the permanence of coatings, this is a question which seems yet to be in doubt. Some report that the spray coatings seem to be equal to that of the brush method, while others are of the opinion that it is not as satisfactory as brushing the material thoroughly. This, of course, could be determined by making a comparative test.

### DISCUSSION

Following the reading of this paper another paper along somewhat the same lines was read by H. J. Barkley (I. C.), after which the two papers were discussed together. A. B. Phelps (N. Y. C.) questioned the saving of 30 per cent of the material. Others raised the same point. One or two members related some unsatisfactory results secured with the spray process, but upon inquiry by others it developed that these experiences concerned the use of home-made devices or to attempts to use the spraying machines without proper instruction or training. President Conrad stated that in painting some girders stored in a yard one man with a spray accomplished as much as five men with brushes, but he did not claim that this record could be equaled on all classes of work. He found the spray of particular advantage for close quarters, as on the inside of box girders, but felt that there was a considerable value in the thorough brushing of paint, which was not obtained with the spray process. In answer to Ernest Lux (C. R. R. of N. J.), Mr. Conrad said that he mixed a certain amount of turpentine with the paint to thin it, but had found it practicable to use straight lead and oil in the machine.

The general tenor of the discussion indicated a serious interest in the possibility of the spray process, for, as stated by Mr. Lux, it looked as if the spray machine might be the solution of the labor problem of the master painter. C. K. Collenberg (U. P.) called upon the members to co-operate with the manufacturers in the development and application of this labor-saving device. Mr. Conrad emphasized the necessity for thorough instruction of the workmen in the proper use of the spray; in his experience the men were very much opposed to the machine at the start, but became very enthusiastic about it after becoming accustomed to its operation.

### A CATECHISM ON PAINT SPRAYING

After this discussion a lantern slide talk was given by C. B. Lyons, representing the DeVilbiss Manufacturing Company, on camouflage spray painting in France. He followed this by a general discussion of spray painting practice, this also being presented by means of slides. Many of the questions which had been raised in the course of the preceding discussion were answered by Mr. Lyons in the form of a catechism on spray painting practice, which is presented below.

1.—Question—What is the thickness of the film of paint applied by the spray?

Answer—The spray can be regulated to apply the same amount as a brush coat or more if necessary.

2.—Q.—What is the weight of the spraying machine?

A.—The spray itself weights 15 ounces; the compressing outfit mounted on a four-wheel truck weighs approximately 1,200 lb.

3.—Q.—How many gallons of paint does the paint container hold?

A.—Containers range from 7 gal. to 60 gal. in capacity. A 7-gal. pressure tank is the standard for master painters.

4.—Q.—What kind of materials are best suited for the spray?

A.—Any kind of material can be sprayed, such as stains, lacquers, varnishes, fillers, water paints, oil paints and enamels not mixed heavier than 24 lb. per gal.

5.—Q.—How far is the spray held from the work?

A.—The general average is from eight to ten inches.

6.—Q.—What is the mix of spraying paint?

A.—Usually about the same as for brushing, sometimes 10 to 20 per cent thinner.

7.—Q.—Can the spray be used on a windy day?

A.—Yes, as the spray is held so close to the work that very little paint is blown away.

8.—Q.—How much air is necessary to atomize the paint?

A.—Lead and oil from 40 to 50 lb. Lighter materials require less air.

9.—Q.—What is the loss of paint with the spray compared with the brush?

A.—None, if handled properly. A small amount is apparently wasted, but this is offset by the more uniform coating applied.

10.—Q.—What is the covering capacity of the spray?

A.—Approximately 500 to 600 sq. ft. per hr. per man. On some kinds of work considerably more.

11.—Q.—What height can paint be lifted to the spray?

A.—Any distance up to 50 ft. from the paint tank.

12.—Q.—Can small trim be painted and sash traced?

A.—Not to good advantage.

13.—Q.—How are windows protected from the specks of paint flying through the air from the spray?

A.—By placing light canvas or muslin in seven or eight foot lengths over the window. Lower the upper sash and raise the lower. Place the canvas over the top sash, bring down and over and under the lower sash; then close both sashes. Closing the sash tightens up the canvas.

14.—Q.—Is there any saving of scaffolding with the use of the spray?

A.—About 30 per cent in most cases and where an extension pole is used at least 50 per cent.

15.—Q.—Where is the spray used to the very best advantage?

A.—Where there is a large amount of straight surface work. Also on uneven surfaces, such as caps and "ginger-bread" work, which are hard to brush, and on all rough surfaces such as concrete, brick, stucco and shingle roofs.

16.—Q.—Does the paint clog the spray?

A.—No, if the material is properly strained into the tank and the nozzle cleaned after each job.

17.—Q.—What furnishes the power for the compressor?

A.—Either a two or four horsepower gasoline engine, or electric motor, whichever is more suitable for the master painter.

## "THE LIMITED PALETTE"

By G. W. Thompson

Research Laboratories, National Lead Company, Brooklyn, N. Y.

It would appear that if we had the right pigments, all colors might be made from three pigments in addition to black and white. Having, however, certain limits imposed upon us by the art of manufacturing pigments, we find that the fewest pigments that must be used to produce all the colors are four, in addition to black and white, namely, Venetian red, Prussian blue, chrome green and chrome yellow, and the purpose of this paper is to show the extent to which these four pigments, considered as a "limited palette," can be used in conjunction with a black pigment and a white pigment to produce practically all of the colors that are needed.

It is necessary to explain two important qualities which colors possess, namely, hue and luminosity. The word hue describes that property of color which distinguishes colors from each other. White is not considered as having hue, and we therefore distinguish a yellow, green, blue or red from a white in that they are hues. By luminosity we mean that varying power which colors possess of affecting the eye, and it has been asserted that the intensity with which colors affect the eye is proportional to the white light they reflect.

In order to explain this matter I wish to refer to an instrument invented by Arthur Howland of Boston, which he calls his color photometer. This consists of a machine whereby standard colors can be spun in any proportion, together with black and white, and by it practically any color can be matched and analyzed. Mr. Howland has confirmed, by the use of his machine, a fact rather well known, that if red, blue and green are spun in proper proportion, a neutral gray can be produced. I believe that Mr. Howland has made a very valuable contribution to the study of color, and that his machine and system which he has developed in representing color is worthy of very general consideration and interest. At one time it was assumed that the primary colors were red, yellow and blue, and more lately it has been asserted that the primary colors are red, green and blue. It seems probable, however, that there is no such thing as primary colors, but rather that there is an indefinite number of hues.

It should be borne in mind that the practical application of this is very narrow as compared with the theory involved. Theoretically, by blending a red hue, a blue hue and a green hue, in varying proportions, we should be able to produce all of the intermediate hues. However, because of the limitations which pigments have, we are compelled to use yellow in addition to red, blue and green to produce even the "limited palette."

Most of the colors used for decorative purposes can be produced by mixing together white lead, lampblack, Prussian blue, chrome green, chrome yellow and Venetian red. Thus we started with five mixtures. We took the best coloring materials we could get and reduced them with white lead in about the following proportions:

| | |
|---|---|
| Venetian red | 1 part |
| White lead | 25 parts |
| Chrome yellow | 1 part |
| White lead | 5 parts |
| Chrome green | 1 part |
| White lead | 2 parts |
| Prussian blue | 1 part |
| White lead | 25 parts |
| Lamp black | 1 part |
| White lead | 50 parts |

These mixtures are the strong colors from which all the other colors are produced. In various proportions they can be mixed with white to produce lighter tints and together to produce intermediate colors. Furthermore, these intermediate colors can be mixed with white to produce their lighter tints. Thus, to obtain tints with each of these colors, we mix them with additional quantities of white lead according to a definite scheme of geometrical proportion. We followed this same procedure with reference to the yellow, the green, the blue and the gray. We then proceeded to make mixtures of red and yellow in equal proportions and produced tints from them on the same basis as the tints of the strong colors were produced. We did the same with a red-green mixture, a red-blue mixture, a red-gray mixture, a yellow-green mixture, a yellow-blue mixture, a yellow-gray mixture, a green-blue mixture, a green-gray mixture and a blue-gray mixture.

We also made combinations of the three standards. We have carried our method of combination one step further by taking two parts of one color and one part each of the other colors to get 30 combinations.

I am sure that you will agree with me that there are great possibilities in this scheme of the "limited palette" for the production of a great variety of colors for decorative purposes. We are not claiming in this scheme of

color combinations anything more than a practical method for the production of colors suitable for decorative purposes. There are, of course, a large number of colors for special purposes, such as signals, etc., that lay outside of our scheme. There are also refined methods of decorations, such as fresco, etc., for which we are not attempting to furnish color combinations. We must always recognize that color is a purely relative thing. If you attempt to match a given color by the scheme which I have outlined, undoubtedly you will find differences which may be small or may be great, in proportion to the closeness to match which you desire and also in proportion to the actual nearness in location of the two colors which you are attempting to compare.

## VOCATIONAL TRAINING

BY D. LOUIS IRETON

Chairman, The International Trade Education Development Committee of the United States and Canada, New York.

The subject upon which I shall ask your indulgence is one that is already causing grave fears and much apprehension in all lines of industry as well as with our government, namely, that of supplying trained workmen for the trades, and for training our American youth for their places in industry and civil life. The need for more and better trained workmen in the painting trade is recognized everywhere. The abandonment of the old-time apprenticeship system, and our dependence upon foreign trained or untrained brush hands has caused a great deterioration in the quality of the work, and a lowering of its standards, until now we find it very hard to attract ambitious boys and young men to the trade. Unless there is a great awakening among those directly interested and greater co-operation and support of some definite apprenticeship system by master painters and manufacturers of paint materials, we are bound to suffer the consequences.

Ever since the passing of the old apprenticeship system, little or no consideration has been given to providing a substitute, because in our rush for greater production, and the ease with which we obtained the foreign trained worker immigrating to our shores, caused us to forget and willfully neglect our own American youth, who were left to drift haphazardly into all kinds of blind-alley jobs that lead nowhere.

America is a great industrial nation and must in the future depend upon her own resources for supplying the necessary skill and efficiency. It can no longer rely upon the foreign trained product, as in the past, but it is our own American youth who must meet the new conditions, and right now is the time for us to adopt a system of training that will fit them for present emergencies, and for others that are bound to follow as additional demands are made upon us. This presents problems, the solution of which calls for the fullest co-operation of all trades.

It is generally recognized that in abandoning the training which was given by apprenticeship and falling in line with the trend towards specialization in modern industry our workmen became greatly handicapped. There is a vast difference between the mechanic trained in one operation and the craftsman who has been trained thoroughly for all operations. The industries still have need for workmen who are qualified to assume every part of the particular trade in which they are engaged, and this can be provided for only through a properly organized apprenticeship system, either in the shops or schools, where a trade is taught in its entirety and a definite standard of ability established.

We must meet the issue fairly and squarely and solve the problem through compulsory laws if need be, but let us put a stop to this vast waste that results from our present faulty system, which menaces the welfare of thousands of our youth and causes millions of dollars of loss to employers through the lack of efficient and properly trained workmen. Let us have trade schools that will not only extend vocational training, but also help in increasing civic efficiency.

At the time when they contemplate entering upon trade or industrial careers, our young men and women need helpful, sympathetic guidance. We should aim to overcome the evils of the haphazard choice of occupations, which can only lead to unrest and unhappiness to the worker, great loss to employers and the industrial backwardness of the nation.

The national government believes in this new and much needed form of education as very essential to the country in establishing standards of efficiency for all vocations. But you must bear in mind that no scheme of education is self-operating, and that your craft will not be represented in this broad and most liberal provision unless you personally take the initiative in your own locality and thereby show the necessity for training apprentices in your craft.

In conclusion, I would warn you of the great problems facing us, of the unrest among the laboring classes, of the dangerous propaganda and influence of agitators striving to obtain control of our labor element for personal gains. The demoralization of our laboring classes by this alien element is far reaching, and its influence will be felt not only in our workshops but also in our homes.

We must have 100 per cent Americanism among our workers, and we must insist that in our system of education and training, and also in the utilization of our resources, we recognize and maintain a standard that will insure 100 per cent Americanism in our civic, social and industrial life.

## OTHER MATTERS

In addition to the subjects reported above an informal talk on matters of general interest to the paint foreman was given by H. A. Gardner, director of the Institute of Industrial Research, Washington, D. C. Economy in the handling of tools was a subject assigned to one of the committees, but as no report was presented, the matter was discussed informally by the members. It was the consensus of opinion than a very unsatisfactory state of affairs has come about with regard to tools as a result of the inferior class of painters employed. The low-efficiency workman has no regard for the value of the equipment given him to work with. Consequently, a great many brushes, dusters, etc., are lost. C. K. Collenberg (U. P.) suggested that the men ought to supply their own equipment, that a man who takes pride in his work, as for instance a sign painter, will have his own brushes. It was generally considered that dusters and putty knives come under the head of personal equipment that each man ought to supply.

One speaker told how he was compelled to check all equipment out to the men in the morning and hold them responsible for all shortages in the evening when the tools were turned in. The one objection to this plan is that it resulted in a pooling of the tools among the men instead of encouraging the good workman to take good care of the tools which he himself used daily. Wm. Dunstan (D. M. & N.) said that dusters and putty knives were cheaper than men and it was better to supply these to the men as they needed them rather than have the men quit the job. Mr. Collenberg spoke at some length on the advantage of the motor car and it developed in the remarks made by others, that while some of the members had enjoyed the use of these valuable utilities for a num-

ber of years, not a few had been unable to obtain any thus far.

### CLOSING BUSINESS

Acting upon the suggestion of President Conrad, the date of the next convention was selected so as not to conflict with that of the Bridge and Building convention, and it will be held at Detroit, Mich., on October 5, 6 and 7, 1920.

The annual election of officers resulted in the selection of the following officers for the coming year: President, H. F. Jones, master painter, Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind.; first vice-president, H. B. Wilson, master painter, Bessemer & Lake Erie, Greenville, Pa.; second vice-president, Bert. E. Darrow, master painter, Atchison, Topeka & Santa Fe, Kansas City, Mo.; secretary-treasurer, E. E. Martin, master painter, Union Pacific, Kansas City, Mo. Following his installation as executive officer, President Jones selected as members of the executive committee the following: Chairman, H. E. Conrad (ex-president); E. E. Martin (secretary); F. C. Rieboldt, master painter, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.; Henry Crooks, master painter, Pittsburgh & Lake Erie, Pittsburgh, Pa.; J. T. Lewis, master painter, Wabash, Delphi, Ind; W. S. Lacher, managing editor, *Railway Maintenance Engineer*, Chicago; Chas. Fyfe, master painter, Atchison, Topeka & Santa Fe, Amarillo, Tex., and L. T. Hornbuckle, master painter, Wabash, Decatur, Ill.

Activities incidental to the convention included a theater party for the members and their wives, as guests of the paint manufacturers on Wednesday evening, and a dinner on Thursday evening attended by members and friends of the association.

## WOOD PRESERVATION STATISTICS FOR 1918

TIMBER PRESERVATION in the United States received a considerable setback during 1918, since there was a reduction of over 10 per cent in the cubic feet of wood subjected to treatment during that year as compared with the year previous. This fact is brought out in the statistical report prepared by the United States Forest Products Service in co-operation with the American Wood Preservers' Association and published in the annual proceedings of that association.

According to these statistics the volume of wood treated in 1918 was 122,612,890 cu. ft., as compared with 137,338,586 cu. ft. in 1917. The number of railroad cross ties treated in 1918 was 30,609,209, or 2,850,261 less than the 33,459,470 reported for 1917. The amount of piling treated in 1918 was 12,286,517 lin. ft., as compared with 12,695,567 lin. ft. in 1917. The number of wood blocks treated was 2,398,869 sq. yd., or less by 1,062,071 sq. yd. than the quantity treated in 1917. In the case of construction timber, which includes bridge timber, switch ties, etc., the quantity treated in 1918 was 122,587,120 ft. b. m., or a decrease of 15,000,000 ft. b. m. from the quantity report in 1917.

This decrease in the amount of timber treated during the year has, of course, a direct relation to the amount of preservatives used. In the case of coal tar creosote, of which there was a distinct scarcity during the latter part of the war period, the consumption was 47,787,998 gal. in 1918, or a reduction of 22,610,611 gal., or 30 per cent, as compared with the quantity reported for 1917. The consumption of water-gas tar, 2,822,652 gal., paving oil, 4,057,862 gal., and miscellaneous preservatives, 28,013 gal., also represent decreases as compared to 1917. However, in the case of zinc chloride, of which 31,101,111 lb. were used during 1918, there was an increase to the amount of 4,656,422 lb., as compared to 1917.

These statistics were gathered by the Forest Products Service from signed statements received from 101 treating plants out of a total of 107 plants of all kinds in active operation during 1918. There are 123 treating plants in the country at the present time, but 16 of these were idle for one reason or another during the year.

CONSUMPTION OF WOOD PRESERVATIVES BY THE TREATING PLANTS OF THE UNITED STATES 1909 TO 1918

| Year | Plants Number | Creosote (a) Gallons | Zinc Chloride Pounds | Other Preservatives (b) Gallons |
|---|---|---|---|---|
| 1909 | 64 | 51,431,212 | 16,215,107 | (c) |
| 1910 | 71 | 63,266,271 | 16,802,532 | 2,333,707 |
| 1911 | 80 | 73,027,335 | 16,359,797 | 1,000,000 |
| 1912 | 84 | 83,666,490 | 20,751,711 | 3,072,462 |
| 1913 | 93 | 108,373,359 | 26,466,803 | 3,885,738 |
| 1914 | 94 | 79,334,606 | 27,212,259 | 9,429,444d<br>2,486,637 |
| 1915 | 102 | 80,859,442 | 33,269,604 | 3,205,563d<br>1,693,544 |
| 1916 | 117 | 90,404,749 | 26,746,577 | 5,675,095d<br>582,754 |
| 1917 | 115 | 75,541,737 | 26,444,689 | 7,579,819d<br>137,361 |
| 1918 | 107 | 52,776,386 | 31,101,111 | 4,057,862d<br>28,013 |

(a) Includes coal-tar creosote and water-gas tar.
(b) Includes refined coal-tar, corrosive sublimate, and carbolineum oils.
(c) Statistics not available.
(d) Paving oil.

The prices paid for preservative materials did not increase as much between 1917 and 1918 as in the previous 12 months. The following table gives the range of prices for the years 1917 and 1918 compared:

| Preservative | 1917 | 1918 |
|---|---|---|
| Coal tar creosote, per gal..... | $0.065 to $0.230 | $0.075 to $0.360 |
| Water-gas tar, per gal..... | 0.043 to 0.060 | 0.054 to 0.075 |
| Zinc chloride, 50% solution, per lb. | 0.029 to 0.075 | 0.030 to 0.045 |
| Zinc chloride, fused, per lb..... | 0.063 to 0.085 | 0.065 to 0.085 |

Of the total quantity of timber subjected to treatment during the year, measured in cubic feet, 75 per cent consisted of cross ties. Of the total number of ties treated, 30,609,209, the number that were hewed was 19,502,999, as compared to 11,106,210 sawed. Of the total number, 38 per cent, or 11,714,728, were oak ties, 33 per cent, or 10,216,064 were yellow pine ties and 13 per cent, or 3,855,318, were Douglas fir. Formerly more ties were treated with creosote than with zinc chloride, but with the scarcity of creosote in 1918 larger use was made of the zinc chloride, with the result that during the year covered by the report 17,055,382 ties were treated with that material, as compared with 11,546,049 treated with creosote. A total of 2,007,778 were treated with zinc-creosote emulsion, while no ties were subjected to treatment with miscellaneous preservatives. During 1918 lighter injections of preservatives were given. In the case of creosote, water-gas tar and paving oil the amount of preservative forced into the wood was 7.77 lb. per cu. ft., for zinc chloride it was 0.47 lb. per cu. ft., while with the zinc-creosote emulsion the injection averaged 2.61 lb. of creosote and 0.49 lb. of zinc per cu. ft.

The piles subjected to preservative treatment during the year were principally Douglas fir and Southern yellow pine, with a small amount of oak. In treating piles with creosote, water-gas tar and paving oil an average injection of 13.79 lb. per cu. ft. was obtained, while in the case of zinc chloride the average absorption was 0.46 lb. per cu. ft. and in the case of the emulsion it amounted to 2.5 lb. of creosote and 0.51 lb. of zinc per cu. ft.

# ACTIVITIES OF THE RAILROAD ADMINISTRATION

## The Esch Bill Passes the House With Amendments

## Wages of Employees and Salaries of Officers

Washington, D. C.

WHILE ACTIVE preparations are being made for the return of the railroads to company management on December 31, it has become generally recognized in Washington that it is now practically impossible to complete the proposed permanent legislation for their future regulation before that time and it is planned to put through Congress a temporary resolution providing for an extension of the guaranteed standard return until the permanent legislation can be passed, or until the railroads can obtain from the Interstate Commerce Commission a decision on the application for an increase in rates which they are planning to present soon after the first of the year.

This plan was proposed by the Senate committee on Interstate Commerce after it became apparent that the Senate would not finish its discussion of the peace treaty in time to allow the railroad bill to be taken up or to make much progress before the regular session which begins in December. The leaders of the House declined to consent to the temporary plan, however, until they had passed the Esch bill, formulated by the House committee. Work on the bill was hastened and it was passed on November 17 after only a week of debate. The Senate plans to make an effort to pass the Cummins bill in December, but as it contains so many provisions regarded as certain to provoke a protracted contest, and as it differs so widely from the House bill, there is no expectation of passing it before the end of the year. Even if it were passed the two conflicting bills must be reconciled by a conference committee which would doubtless require a long time to work out an agreement because of the widely varying views of the two branches of Congress.

The rules of the Senate are such that it is practically impossible to "railroad" a bill involving so many controversial questions in the way the Esch bill was put through the House.

The Esch bill as passed provides for a six months' extension of the guaranty, for a funding for 10 years of the indebtedness of the railroads to the government for capital expenditures made by the Railroad Administration, estimated at $775,000,000, after deducting a part of what the government owes the railroads on account of the guaranty, and also provides a fund of $250,000,000 which may be used for loans to railroads. As a protection to the government against the possibility of "extravagance" on the part of the railroads in their expenditures for maintenance during the temporary guaranty period, it is provided that there shall not be included in the operating expenses for that period more than an amount fixed by the Interstate Commerce Commission and that in fixing the amount the commission shall so far as practicable apply the rule of standard contracts between the railroads and the government governing maintenance during the period of federal control.

Most of the provisions of the bill are in the direction of increasing the regulating powers of the Interstate Commerce Commission. The House voted down a section giving general legislative instructions to the commission as to the elements to be considered in the determination of rates. One of the most important provisions of the bill was inserted by the influence of the railroad labor organizations prescribing a method of adjusting disputes over questions of wages and conditions of employment through the medium of three boards of adjustment and three commissions on labor disputes, each composed of an equal number of representatives of the railroads and of the employees' organizations but without any provision for a decision in case of a disagreement. It is also provided that "all decisions of a general character heretofore made by the United States Railroad Administration affecting the questions of wages, hours of service, or conditions of employment, are hereby confirmed and shall apply to all carrier lines subject to this act." Decisions of the Railroad Administration applying to individual lines are to remain in effect until superseded by mutual agreement or by decision of a board of adjustment or commission on labor disputes.

### Agreement of Rules and Working Conditions

An agreement has been signed between the Railroad Administration and the United Brotherhood of Maintenance of Way Employees on a national agreement covering rules and working conditions similar to that recently completed with the organizations representing the shop employees. The details of this agreement are presented on another page.

In this document, signed by Director General Hines and the officers of the four brotherhoods, the director general has agreed to the principle of time and one-half for overtime on certain conditions, and it is understood that as this had been the principal point of controversy it was not difficult to come to an understanding on the other points involved. For a long time the Railroad Administration had been unwilling to allow a higher rate for time in excess of a basic day, but the principle had been granted to other classes of employees, and the director general had recently announced a proposal to allow time and one-half for overtime in freight train and engine service—that is, for the time required to complete a run in excess of what would be required if an average speed of 12½ miles per hour were maintained—providing the brotherhoods will give up the provisions in their schedules for arbitraries and special allowances.

The four brotherhoods began a meeting at Cleveland on November 17 to consider whether they should accept the proposal under the conditions. The rules are based on recommendations made to the director general by the Board of Railroad Wages and Working Conditions, to which the question was referred about the first of the year. Its recommendations were based on a code

of rules drafted by committees of representatives of the union and of engineering representatives of the regional directors.

A similar code of rules and working conditions for the signal department employees is also under consideration.

### SMALL RAIL ORDER PLACED

Although the Railroad Administration's proposed rail order for 200,000 tons was postponed a little while before the steel strike was called, the Railroad Administration was able to place an order for 41,000 tons with the Bethlehem Steel Company after the strike was called.

### EMPLOYEES AND THEIR COMPENSATION

The number of employees on the Class I railroads under federal control in July, 1919, was 1,894,287, as compared with 1,703,748 in December, 1917, the last month of private operation, according to a report submitted by Director General Hines in response to a Senate resolution asking for informtaion regarding changes in wages, hours and numbers of employees. The report shows a reduction in the number of employees in February and March of this year as compared with January, an increase in April and May, a slight reduction in June and another increase in July.

The increase in number between December, 1917, and July, 1919, was 11.5 per cent, but Mr. Hines points out that there was a decrease of 3.9 per cent in the number of hours worked. He attributes the increase in the number of employees largely to the adoption of the eight-hour day, which has necessitated a larger number of employees to perform the same number of hours of service. The total compensation in July, 1919, was $226,140,935, as compared with $153,039,938 in December, 1917. The average increase in the unit of compensation was 53 per cent, and allowing for the recent retroactive increase for the shopmen it is estimated at 56 per cent, but the actual increase in earnings per employee per month, because of the shorter hours worked, was only 35.3 per cent, according to the report. As compared with the calendar year 1917 the increase was 45.3 per cent. The average monthly compensation in July, 1919, is given as $121.50, as compared with $89.83 in December, 1917, and $83.64 as the average for 1917.

The average monthly compensation per employee for the classes engaged in maintenance of way and construction work is shown as follows:

| | Number July, 1919 | July, 1919 | December, 1917 | Calendar Year 1917 |
|---|---|---|---|---|
| Assistant engineers and draftsmen | 10,370 | $138.96 | $104.74 | $95.40 |
| M. W. and S. foremen | 8,119 | 142.68 | 106.90 | 99.74 |
| Section foremen | 40,899 | 108.18 | 78.21 | 73.84 |
| Structural iron workers | 673 | 131.58 | 86.17 | 84.53 |
| Carpenters | 50,854 | 117.30 | 81.70 | 78.35 |
| Masons and bricklayers | 1,186 | 115.37 | 80.88 | 77.64 |
| Painters and upholsterers | 12,632 | 118.64 | 85.89 | 79.22 |
| Section men | 286,300 | 77.80 | 53.48 | 50.09 |
| Other unskilled laborers | 118,932 | 87.60 | 63.77 | 57.94 |
| Foremen of construction gangs and work trains | 1,910 | 128.04 | 101.71 | 85.91 |
| Other men in construction gangs and work trains | 30,306 | 81.84 | 59.24 | 51.95 |

### SALARIES OF RAILROAD OFFICERS IN 1917

A list of 208 railroad officers receiving salaries in excess of $20,000 a year during the year 1917 was put into the Congressional Record of November 18 as an extension of remarks by Representative Thetus W. Sims of Tennessee in connection with his proposed amendment to the Esch railroad bill to provide that not exceeding $20,000 of the compensation of a railroad official should be charged to operating expenses or be considered by the Interstate Commerce Commission in reaching its conclusion as to the reasonableness of rates. Mr. Sims also used it as an argument against a proposed section of the bill, which was eliminated, requiring the commission to take into consideration "the reasonable cost of maintenance and operation." In the list, which Mr. Sims said he had got from "the report of the Government Railroad Wage Board," the highest compensation shown was that of J. M. Dickinson, receiver of the Chicago, Rock Island & Pacific, $120,732.90. R. S. Lovett, as chairman of the executive committee of the Union Pacific, is shown as having received $104,104.16. Julius Kruttschnitt, A. J. Earling, Walker D. Hines, L. F. Loree, Samuel Rea, E. P. Ripley, A. H. Smith, W. H. Truesdale and F. D. Underwood are shown as receiving $75,000 or over. There were 10 in the list receiving approximately $60,000 and 14 receiving approximately $50,000.

### OPERATING RESULTS FOR SEPTEMBER

The deficit of the Railroad Administration in the operation of the railroads for this year was reduced to $192,758,699 by the September results, as reported by the Operating Statistics Section of the Railroad Administration. The net operating income for September was $77,744,395, which was a decrease of $21,304,734 as compared with September, 1918, but represents a profit to the government over its guaranteed rental of $3,391,419. This is after charging off an estimate of the wage increase recently granted to the shop employees which was retroactive to May 1. After deducting $16,000,000 on this account the profit to the government on the September operations was approximately $19,000,000. For the nine months' period the net operating income was $402,065,109, as compared with $514,282,316 for the corresponding period of 1918, and as compared with $594,823,808, which represents 9/12 of the annual rental.

The expenditures for maintenance of way and structures in September were $69,036,844, as compared with $60,220,089 in September, 1918, and as compared with $36,574,000, the average for September in the test period. For nine months they were $575,122,124, as compared with $459,627,192 for the corresponding period of 1918, and as compared with $310,096,000 for the corresponding months of the test period.

## AN INEXPENSIVE PRESERVATIVE

FREQUENTLY SMALL amounts of timber are used under conditions that make some form of preservation advisable and where it would not be expedient to have the material treated at a commercial plant. Coal-tar creosote, though easily applied, is often objectionable and in such cases the Forest Products Laboratory, Madison, Wis., calls attention to the fact that the zinc-chloride steeping process may be used to advantage. Although this process is not as thorough a treatment as impregnation under pressure, it will add sufficient life to the timbers, even where they are used in damp ground, to justify its use. However, a water-soluble preservative, such as zinc-chloride, cannot be recommended for timbers which are exposed to the leaching action of either standing or running water.

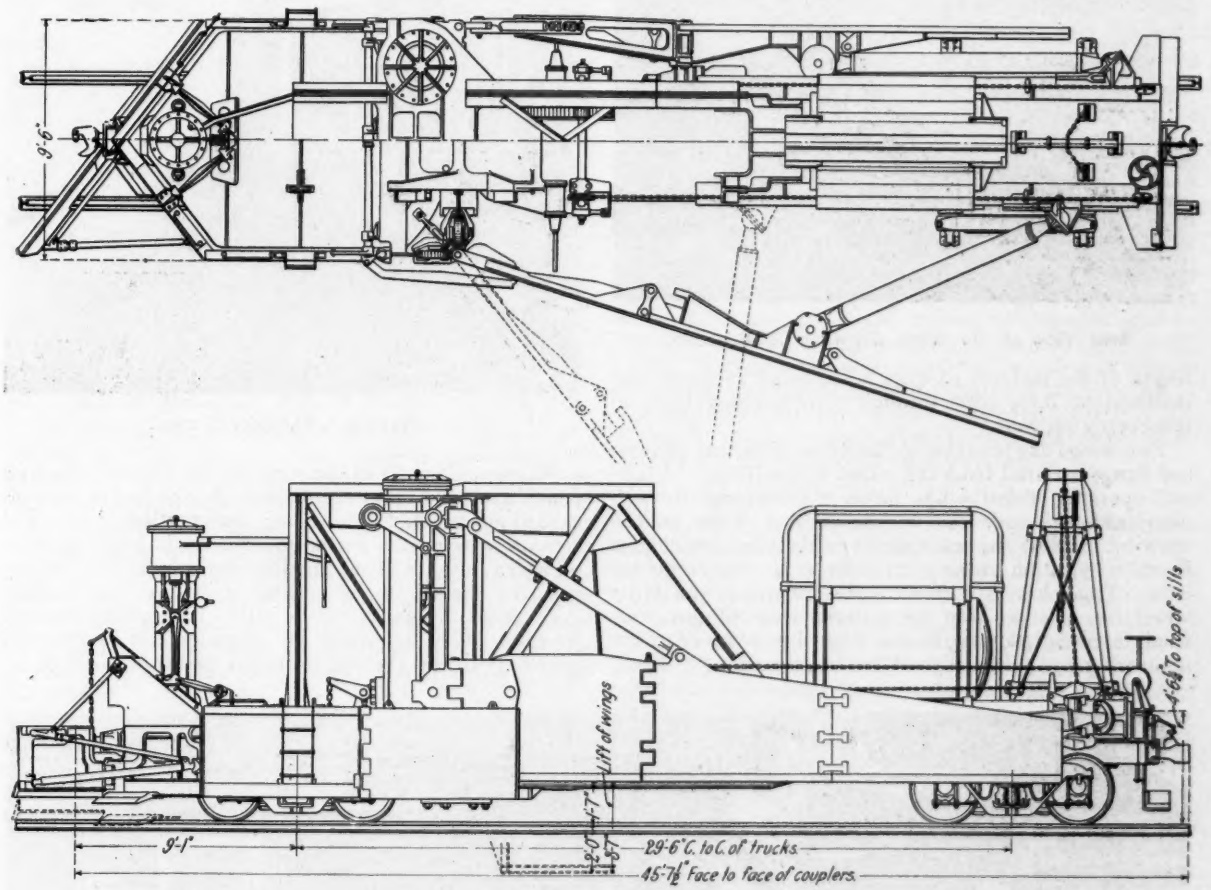
Zinc chloride can be purchased either in solid form or in a 50 per cent solution which, for treatment by the steeping process, should be dissolved or diluted in water to a 5 per cent solution, i. e., 5 lb. of solid and 95 lb. of water, or 10 lb. of the 50 per cent and 90 lb. of water. As the solid form absorbs water rapidly when exposed to the air, it should be made into a solution as soon as the package is opened.

In the treating process itself the timber is piled in a vat, sufficiently long and large, with separators placed between the courses so that the solution will reach every part of each stick. The timber is then allowed to soak or steep for a period equivalent to its thickness in inches

plus one additional day, i. e., a one-inch plank should remain in the solution two days, a six-inch stick for seven days and so on. Where time is not an important factor, longer steeping will be of distinct advantage, especially where the timber is to be used in damp ground or in damp places. In this case and also where slight shrinkage would be objectionable, the timber should be thoroughly seasoned before being used.

# A New All-Steel Spreader Car

THE BUCYRUS COMPANY, South Milwaukee, Wis., has developed and is now introducing a spreader which embodies a number of new features. This spreader has been subjected to an extended series of tests on lean ore and stripping dumps on the Minnesota Iron Range near Hibbing, Minn., for the past month, where it has demonstrated its ability to stand up under unusually hard service. It is designed to plow material from between the rails to either or both sides to a depth of 2½ in. below the top of rail and to spread it at either side for a maximum distance of 24 ft. from the center of the track.




**General Plan and Elevation of the New Spreader**

This spreader is of unusually heavy design and is built of steel throughout. It weighs 136,620 lb., of which 80,640 lb. is carried on the front truck, this latter weight being an important factor in holding the spreader on the track and reducing the liability of derailment. The underframe is designed throughout for 100,000 lb. compression stress through the draw bar. It is equipped with the Waugh friction draft gear and is built to M. C. B. standards throughout.

The wings, which weigh approximately 12,000 lb. each, are solid steel castings made in three sections with a total length of 25 ft. The section at the outer end is fastened to the rest of the wing by three Bishop bolts so designed that they will break before the wing itself suffers injury in striking a large boulder or other obstruction. When in position the wing spreads a minimum width of 12 ft. and a maximum of 24 ft. when horizontal or of 22½ ft. when inclined at the greatest angle. It can spread to a level of 19 in. above the top of rail or 24 in. below, giving a maximum vertical range of 43 in., which can be secured in increments of three inches. The wing can also be inclined at the outer end to a maximum depression of 12 in. below the inner end or an elevation of 84 in. above it. The wearing edge on the wings is of high carbon cast steel angles. An important development in this spreader is the arrangement whereby the wings can be folded in to the car regardless of the pitch or angle at which it may be standing.

The spreader wing is supported in position by a cylindrical wing brace of 9-in. extra heavy pipe. The forward

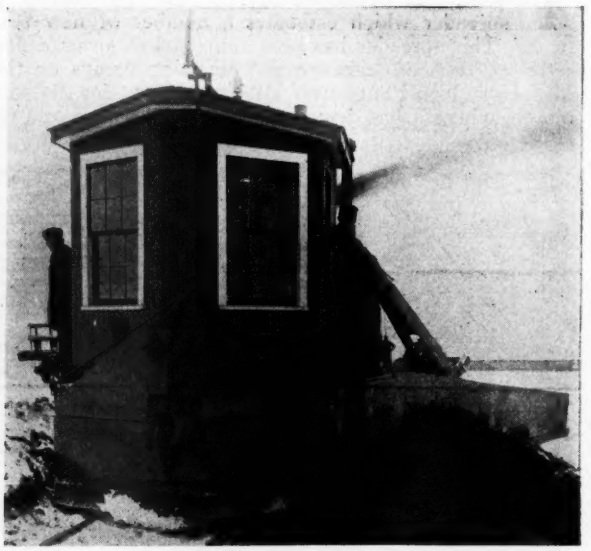
end of this brace is attached permanently to the wing by means of a universal joint, while the rear end with a ball and socket joint attachment moves forward or backward on a cast steel guide beam 18 ft. long propelled by an endless chain driven by an air cylinder with rack and pinion. It is locked in place by clamps and is designed to give a variation in spread of 1 ft. between widths of 12 and 16 ft. and of 6 in. beyond that. By means of this arrangement, the width of spread can be changed with little effort and in not to exceed one minute. The vertical inclination of the wing is varied above or below the horizontal by raising or lowering the outer end and by means of a chain hoist and frame at the rear of the car, the

**Rear View of the Wing, Showing Construction**

length of the inclined support brace being varied by the insertion of three bolts through corresponding holes in telescoping sections.

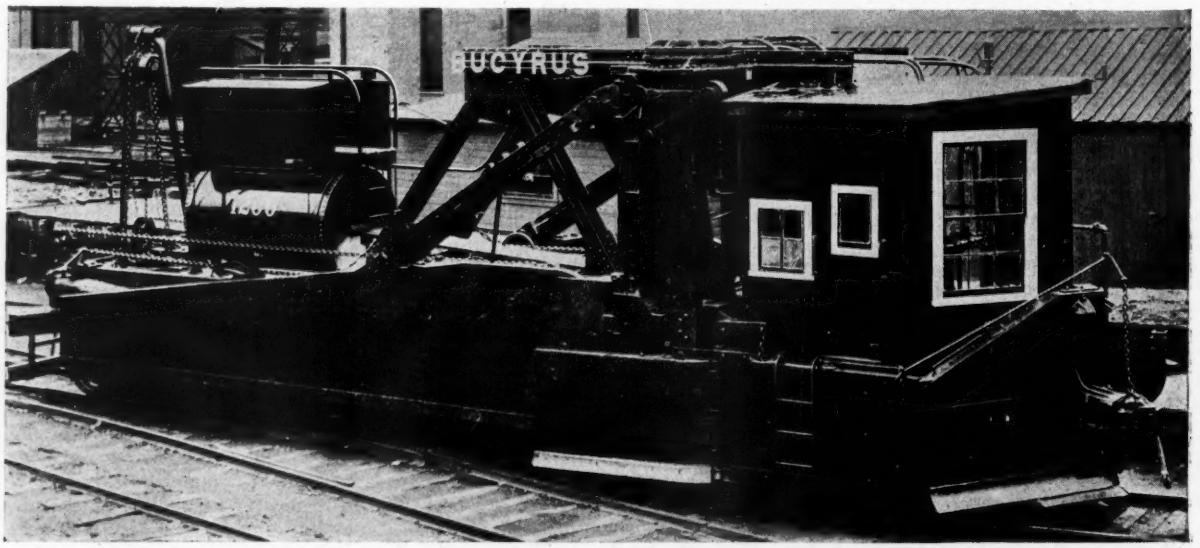
Two wings are provided at the front of the car to plow and flange material from the center of the track. In normal operation these wings throw the material to both sides, although they can be changed as shown on the drawing to plow the material to either side, the change from one position to the other being made readily by one man. This plow is located well forward of the front wheels in order to keep the material clear of them. A small intermediate wing is also located in advance of the main wing and to the rear of the front trucks.

The car is controlled and operated from a table near the front end, which is housed in the spreader illustrated, although the addition of the cab is optional. Four four-way valves are provided, one of which operates each of the larger wings, while a third controls the cylinders opening and closing the wings, one valve opening both wings but operating them one at a time. The fourth valve controls the plow and flanger in the front of the car. An air reservoir 4 ft. in diameter and 7 ft. long is provided in the rear of the car.



**Plowing a Shoulder Down**

All movable parts of the spreader are machine finished, which tends not only towards accuracy of fit but towards ease of operation, with resulting conservation of air. The contact between the wings and the vertical sliding posts on which they are raised and lowered is by rollers, greatly reducing the friction from that with a sliding contact. As a result the wings can be raised with a minimum air pressure of 50 lb., while the spreader can be operated readily with the average train line pressure of 70 lb.




**The Spreader with Wings Folded Back**

## THE MATERIAL MARKET

WITH THE prolongation of the steel strike, the market for iron and steel is approximating war-time conditions under which some buyers are offering premiums to obtain prompt deliveries and not a few manufacturers are refusing orders. The standard prices for iron and steel established by the manufacturers early this year are still being maintained, but certain of the manufacturers have marked up some of the prices, so while the so-called "market" quotations are given in the table below it does not follow that orders can be placed at these prices in all cases.

| | Prices in Cents, Per Lb., Pittsburgh | Chicago |
|---|---|---|
| Track spikes | 3.35 | 3.62 |
| Track bolts | 4.50 | 4.62 |
| Angle bars | 2.75 | 2.75 |
| Tie plates, steel | ... | 2.75 |
| Tie, plates, iron | ... | 2.90 |
| Wire nails | 3.50 | ... |
| Barbed wire, galvanized | 4.20 | ... |
| Cast iron pipe, 6-in. or larger, per ton | ... | 59.80 |
| Plates | 2.65 | 2.92 |
| Shapes | 2.45 | 2.72 |
| Bars (steel) | 2.35 | 2.62 |

Notwithstanding the curtailment of manufacture, the price of scrap continues to rise as will be observed by a comparison of the table below with tables in preceding issues:

| | Pittsburgh Per Gross Ton | Chicago | St. Louis |
|---|---|---|---|
| Rail, relaying | $40.00-$43 | $40.00-$50.00 | $40.00-$46.00 |
| Rail, rerolling | 29.50- 30 | | 30.00- 30.50 |
| Rails less than 3 ft. long | | 23.50- 24.00 | 23.50- 24.00 |
| Frogs and switches | | 20.50- 21.00 | 20.00- 20.50 |
| Angle bars, steel | | 24.00- 24.50 | 20.00- 20.50 |
| Angle bars, iron | | 28.00- 28.50 | 26.00- 26.50 |
| No. 1 Railroad Wrought | 24.00- 25 | 26.50- 27.00 | 23.50- 24.00 |

The rail market for the first time in two years is assuming real importance. The insignificant order of 41,000 tons of rail recently placed by the Railroad Administration is shown in its true light by a comparison with the inquiries being made by the individual railroads for their 1920 requirements, subject to cancellation if the roads are not returned to their owners at the end of the year. Thus, the Pennsylvania Railroad has advertised for 200,000 tons, the Erie for 20,000 to 30,000 tons, some western lines have inquired for 200,000 tons in Chicago and the New York Central is reported also in the market.

Taken the country over, the prices of lumber are easier, but the shortage of cars and unsatisfactory production conditions are interfering somewhat with this tendency. Some idea of the enormous increase in the price of lumber during the last two years is to be gained from a study of the following mill prices on yellow pine taken from a table appearing in the Lumber World Review of November 10:

| | Jan. 5, 1918 | Jan. 29, 1919 | Oct. 15, 1919 |
|---|---|---|---|
| 1 x 4 Edge grain flooring, No. 1 | $33.00 | $37.50 | $70.00 |
| 1 x 4 Flat grain flooring, B. & Btr. | 34.00 | 36.00 | 75.00 |
| B. & Btr. ceiling, ¾ x 4 | 34.00 | 37.00 | 75.00 |
| No. 1 Common boards, 1 x 6 | 28.92 | 31.50 | 45.00 |
| No. 2 Common boards, 1 x 6 | 22.50 | 26.50 | 36.00 |
| No. 1 Common dimension, 2 x 4 | 22.71 | 27.17 | 40.08 |
| No. 1 Common dimension, 2 x 12 | 24.00 | 28.66 | 42.08 |
| No. 2 Common dimension, 2 x 4 | 21.84 | 25.16 | 38.00 |
| No. 2 Common dimension, 2 x 12 | 22.58 | 26.88 | 39.91 |

The requirements of the railroads for concrete materials and ballast are in prospect of no little interference as a consequence of the enormous road building programs of the national and state highway departments. According to figures presented by the Associated General Contractors, these requirements aggregate 275,000,000 tons of sand, gravel, crushed stone and slag.


The officers and executive committees of several of the maintenance of way associations are planning the work for the coming year.

### MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION

An extended report of the annual meeting of this association, which was held at St. Louis on October 21-23, appears on another page of this issue.

### AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION

The newly elected officers of this organization are completing the personnel of committees and arranging for the early inauguration of work for the coming year. The chairmen of the committees have been selected and the personnel of the remaining members is now being completed.

### AMERICAN WOOD PRESERVERS' ASSOCIATION

A meeting of the executive committee was held at the Hotel Sherman, Chicago, on October 25 to consider the work of the association and to plan for the next convention, which will be held in Chicago, on February 10-12, 1920. A committee was appointed to prepare certain amendments to the constitution relative to the adoption of standard specifications and principles of practice and also giving the executive committee power to change the place or date of meeting should an emergency arise.

### ROADMASTERS' ASSOCIATION

A meeting of the members of the executive committee and chairmen of other committees was held at the Claypool Hotel, Indianapolis, on November 8. The selection of members of committees to study and prepare reports on the subjects selected at the last annual meeting was the principal topic for consideration. In addition to the five subjects selected in Chicago it was decided to appoint another committee to present a report on the construction of street and highway crossings.

The proceedings of the September annual meeting are now in the hands of the printer and it is expected that they will be ready for distribution within a month.

### THE AMERICAN RAILWAY ENGINEERING ASSOCIATION

The Engineering section of the American Railroad Association, of which the American Railway Engineering Association is a part, presented a report at the fall meeting of the American Railroad Association, which was held in Chicago on November 18-19, which consisted in the main of the recommendations of the various standing and special committees of the engineering association which were presented to that organization at its annual meeting last March. In addition to these reports specifications for track scales were presented, in the preparation of which the American Railway Engineering Association participated with a number of other organizations.

A number of the committees of the American Railway Engineering Association met in regular or special sessions during the past month to consider whether the present standards of maintenance should be maintained as effecting practices after federal control, reports being prepared by these committees and presented to the American Railroad Association at its November meeting.

# GENERAL NEWS DEPARTMENT

**The annual track inspection** of the Chicago, Rock Island & Pacific has been postponed indefinitely on account of the shortage of coal.

**The Canadian Pacific** has subscribed for $20,000,000 of the new Canadian Victory Loan bonds recently offered in Canada and the United States.

**Engineering Council** has recommended to the president and the members of his cabinet that two or more engineers familiar with industrial problems be appointed members of the new industrial conference.

**The Great Northern Railway Company** has filed a petition with the Minnesota Railroad & Warehouse Commission asking permission to remove its present tracks and terminal facilities at Hibbing, Minn., and relocate them at Alice so as to permit of further mining operations.

**The American Association of Engineers** is organizing for a membership drive to take place during the first two weeks of December. To encourage the efforts of the individual members in this drive, a series of prizes has been offered which includes a life membership in the association, a $100 set of books, a gold watch and a number of watch fobs.

**The State Railroad Commission of Wisconsin** has undertaken a campaign for the elimination of dangerous grade crossings. Colonel H. M. Tripp, formerly associated with the Valuation division of the Interstate Commerce Commission, has been appointed grade crossing engineer and will have charge of this elimination work.

**The revenues of the Panama Canal** for the fiscal year ending June 30, 1919, amounted to $6,354,016.98 while the operating expenses including maintenance and overhead was equal to $6,112,194.77, giving a revenue of $241,822.21 in excess of current expenses. At the end of the 1915 fiscal year the total revenues to that date exceeded the expenses, but from 1915 to 1919 the expenses have increased in a larger amount than the revenues, leaving for the fiscal year ending June 30, 1919, a total deficit to date of $4,618,690.75.

**Engineering Council** has issued a statement regarding the activities of the engineering society's employment bureau which shows that in the interval from December 1, 1918, to September 30, 1919, 17,083 men were interviewed, while 4,858 registered with the bureau, and over 1,000 men were reported placed. This was accomplished at an expenditure of $10,600. The number of engineers visiting the bureau is now 60 to 70 per day.

**The Committee of Engineering Council** on curricula of engineering schools has reported, with reference to a suggestion that the engineering course in the colleges be extended to six years, that it does not favor the substitution of a six-year course for the present four-year course generally in the engineering colleges of the United States, although it calls attention to the fact that the longer course is now offered at a number of colleges. The committee strongly urges the extension of facilities for vocational training throughout the United States and particularly in the industrial centers.

**The Canadian Pacific,** following its custom of naming stations to perpetuate the names of officers and employees of the company, is naming several stations on new lines it is building in the west after officers and employees who were decorated for meritorious service during the war. Among the officers who have been so honored are J. A. Hesketh, assistant chief engineer, Winnipeg, Man.; W. M. Kirkpatrick, assistant freight traffic manager, Winnipeg; F. A. Gasgoigne, superintendent of car service, Montreal, Que.; J. M. Thrasher, fireman, Kenora, Ont.; H. Neighbour, storeman at Winnipeg, and L. B. Unwin, accountant at Schreiber, Ont.

**Five persons were killed and 143 injured** October 29 when northbound Southern Pacific train No. 50 on the San Joaquin division, was wrecked three miles east of Vincent, Cal. The engineer and fireman, one passenger and two trespassers were killed when the engine, two baggage cars and five coaches left the track on a curve and were overturned. Of the 139 passengers injured five were in a serious condition. The responsibility for the wreck was placed by the official board of inquiry of the Southern Pacific on Frank W. Fielder, the engineer who was killed, the accident being due to the excessive speed of the train on an 8 deg. 10 min. curve.

**The Government Spruce Railroad** built in the Olympia peninsula, Washington, and connecting with the Chicago, Milwaukee & St. Paul lines, is 38 miles long and cost approximately $4,000,000. During its construction 3,700 drafted soldiers were employed, who were paid an average of $8 a day by contractors in addition to their government pay. This work was described last week in New York before the congressional subcommittee investigating aviation expenditures during the war.

**Hearings on the steel price basing-point** controversy raised by the Western Association of Rolled Steel Consumers against the United States Steel Corporation and other producers will begin at 10 o'clock Tuesday morning, December 2, at the office of the commission in Washington, as announced by the federal trade commission on October 28. To date over 100 producers and consumers have expressed their views on the subject and with the commencement of the hearings they will be given an opportunity to submit oral testimony.

**Congress has passed a bill** authorizing a further expenditure of $17,000,000 for the government railroad in Alaska. This bill covers the present fiscal year and became a law during the President's illness without his signature. Only $6,000,000 was made available in the current deficiency bill because the House Conferees took the position that, as the further expenditure will not be needed until next year, the remainder of the appropriation could go over to the next sundry civil

**The Canadian House of Commons** on November 6 adopted the bill providing for the government acquisition of the Grand Trunk by a vote of 84 to 53, a government majority of 31. Since that time the bill has passed the senate and has been sent back to the house with an amendment. If the Grand Trunk is acquired the Canadian government will become the owner of the largest railroad system in North America or in the world. This railroad has a mileage in the United States of more than 2,000 miles with numerous branches owned or controlled by the Grand Trunk Railway Company.

**An Engineering Section of the National Safety Council** has been authorized by the executive committee of the council. The purpose of this new section is to enable engineers to contribute more effectively to the solution of engineering problems encountered in safety work. Membership qualifications in this section are parallel to those of the four founder engineering societies with provisions for full memberships and associate memberships, except that in the case of the latter only three years of engineering experience is demanded, although this requirement will be gradually increased to six years. It is intended that the Engineering section will conduct one or more meetings as a part of the annual safety congress in addition to one or more sectional meetings during the year.

**The Division of Industrial Research** of the National Research Council, Washington, D. C., is arranging for the formation of a co-operative association to plan and support fundamental researches in alloys. It is planned to create a special scientific staff composed of a director and assistant director of research and a group of scientific investigators and technical experts who shall give their whole time to the work. To finance the organization each member of the co-operative association will pay $1,000 a year, and all contributing members, who may be either alloy manufacturing or using individuals, firms or companies are to benefit alike by the results of the researches.

# PERSONAL MENTION

## ENGINEERING

**Major M. A. Burbank,** who recently returned from France, has been appointed assistant engineer of line diversion on the Grand Trunk Pacific, with headquarters at Urling and Shere, B. C., and **Colonel W. S. Fetherstonhaugh,** who also recently returned from France, has been appointed division engineer, with headquarters at Prince Rupert, B. C.

**Colonel E. B. Cushing,** recently discharged from military service, has resumed his duties as engineer maintenance of way of the Southern Pacific Lines, the San Antonio & Aransas Pass, the San Antonio, Uvalde & Gulf and the Trinity & Brazos Valley, with headquarters at Houston, Tex., succeeding **C. R. Morrill,** assigned to other duties.

**Lieutenant-Colonel J. A. Hesketh** has returned to Winnipeg as assistant to the chief engineer of the Western Cannadian lines of the Pacific. Colonel Hesketh was formerly chairman of the Manitoba branch. He entered the R. M. C. in 1879 and obtained his first commission with the Canadian Field Artillery in September, 1882. He served in the 7th Fusiliers during the Northwest rebellion and saw service in France, from August 6, 1914, to July 12, 1919, being promoted in May, 1915, to major and again in December, 1918, to lieutenant-colonel. Colonel Hesketh was awarded the honors of C. M. G. and D. S. O.

**J. O. Hackenberg,** division engineer on the Pennsylvania Railroad, with office at Wilmington, Del., who has been promoted to principal assistant engineer of the Southern division, as noted elsewhere, was born at Milton, Pa., in February, 1878, and was educated at the Milton High School and Bucknell University. He entered the employ of the Pennsylvania in May, 1900, as a rodman on the Cambria and Clearfield divisions at Cresson, Pa. In 1901 he was transferred to the chief engineer's department as levelman, and in 1902 was advanced to transitman in the office of the principal assistant engineer at Altoona, Pa. In March, 1903, he was promoted to the position of assistant supervisor at Millersburg, Pa., being transferred to the main line as assistant supervisor of the Middle division in 1904. He was promoted to supervisor in September, 1905, which position he held successively on the Allegheny, Baltimore and Pittsburgh divisions until April, 1917, when he was promoted to division engineer of the Allegheny division, being transferred later in the year to the Maryland division, where he remained until his recent appointment.

J. O. Hackenberg

**S. L. McClanahan,** whose appointment as division engineer on the Chicago, Rock Island & Pacific, with headquarters at Colorado Springs, Colo., as noted in last month's issue, was born in Boone County, Mo., on April 19, 1884. He entered railway service on January 1, 1906, with the Chicago, Rock Island & Pacifiv and served as a chainman and a rodman. From January 1, 1907, to July, 1917, he was a building inspector. In July, 1907, he was promoted to instrument man which position he held until February, 1908, when he left the Chicago, Rock Island & Pacific to go with the Ouchita Coal Company as engineer. In July, 1908, he entered the employ of the Northern Pacific and served consecutively as extra gang foreman, instrument man, assistant engineer, master carpenter and division engineer. On March 30, 1918, he entered the United States Army as a first lieutenant and on May 2, 1919, was appointed a captain, being attached to the transportation corps, A. E. F., until September, 1919.

**George H. Brown,** whose appointment as assistant engineer of maintenance of way in charge of bridges and buildings on the Pennsylvania Railroad, with office at Philadelphia, Pa., as announced elsewhere in this issue, was born in December, 1867, at Renova, Pa. Mr. Brown graduated from Princeton University in 1885, and immediately entered the employ of the Pennsylvania Railroad as assistant engineer in the construction department. From 1889 to 1893 he was assistant supervisor and for the next seven years, supervisor. In 1900 he was appointed division engineer and in 1917 was appointed principal assistant engineer from which position he was appointed assistant engineer of maintenance of way as noted above.

**George H. Brown,** principal assistant engineer of the Eastern Pennsylvania division of the Pennsylvania Railroad with office at Altoona, Pa., has been appointed assistant engineer maintenance of way, with headquarters at Philadelphia, and **T. J. Skillman,** division engineer of the New York division with office at Jersey City, N. J., has been promoted to principal assistant engineer, succeeding Mr. Brown. **J. H. Redding,** division engineer of the Middle division with office at Altoona, Pa., has been transferred to the New York division in place of Mr. Skillman. **W. E. Brown,** division engineer on the West Jersey & Seashore Railroad, becomes division engineer of the Middle division and **M. Lipman,** supervisor at East Liberty, Pa., has been promoted to division engineer on the West Jersey & Seashore Railroad with office at Camden, N. J. **J. C. Auten,** principal assistant engineer of the Southern division with headquarters at Wilmington, Del., has been furloughed on account of ill health and **J. O. Hackenberg,** division engineer on the Maryland division has been promoted to principal assistant engineer, succeeding Mr. Auten. **S. L. Church,** division engineer on the Conemaugh division has been transferred to the Maryland division with office at Wilmington, Del., and **N. B. Pitcairn,** supervisor at Perryville, Pa., has been promoted to division engineer of the Conemaugh division with headquarters at Pittsburgh.

**Thomas J. Skillman,** whose appointment as principal assistant engineer on the Pennsylvania Railroad, with headquarters at Altoona, Pa., is noted elsewhere in these columns, was born at Trnton, N. J., in November, 1876. Mr. Skillman graduated from Princeton University in June, 1898, and entered the employ of the Pennsylvania Railroad as rodman on the New York division in March, 1899. A year later he was transferred to the United Railroad of New Jersey, now part of the Pennsylvania system. In April, 1902, he was promoted to the position of transitman on the Middle division and in February of the following year was appointed assistant supervisor on the Tyrone division, being transferred in January, 1904, to the Philadelphia Terminal division and in 1905 to the Philadelpha division. In August, 1905, he was made supervisor on the Pittburgh division, being subsequently supervisor on the Monongahela division, the Pennsylvana Tube & Tunnel Railroad, now part of the Pennsylvania system, and the New York Terminal division. In June, 1913, he was appointed division engineer on the New York, Philadelphia & Northern, and in December, 1914, was transferred to the West Jersey & Seashore. From April, 1917, to July of that year he was division engineer on the Monongahela division, when he was transferred to the New Jersey division and again in October of that year was transferred to the New York division. In November, 1919, he was appointed principal assistant engineer of the Eastern Pennsylvania division, as noted above.

## TRACK

**Robert Bachar** has been appointed roadmaster of the Indio district of the Southern Pacific, with headquarters at Niland, Cal., in place of **J. Shea,** who has been transferred to the Oakland district, with headquarters at Oakland Pier, Cal., succeeding **L. Bulger,** assigned to other duties. **A. G. Hart,** roadmaster of the Redding district, has been transferred to the Napa district, with headquarters at South Vallejo, Cal.,

in place of **C. L. Crow**, who has been transferred to the Redding district, with headquarters at Redding, Cal.

**H. V. Lange** has been appointed roadmaster on the Sioux City & Dakota division of the Chicago, Milwaukee & St. Paul, with headquarters at Sioux Falls, S. D., succeeding **J. Murphy**, who has resigned. **Richard Erdman** has been appointed roadmaster at Beloit, Wis., succeeding **F. E. Crabbs**, who has been transferred to the Chicago Terminal division, succeeding **M. Burke**, assigned to other duties on account of ill health. **C. Hanson**, roadmaster on the Northern division, with headquarters at Horicon, Wis., has been appointed assistant roadmaster on the Milwaukee Terminal division, succeeding **W. H. Armstrong**, who becomes roadmaster at Horicon, succeeding Mr. Hanson. **C. A. Drawheim** has been appointed roadmaster on the Hastings and Dakota division, with headquarters at Aberdeen, S. D., succeeding **K. Nelson**, who has resigned.

**J. R. Scarlett**, whose appointment as supervisor on the Pennsylvania Railroad, with headquarters at Verona, Pa., is noted elsewhere in this issue, was born on September 12, 1885, at Philadelphia, Pa. Mr. Scarlett graduated from the Lehigh University in 1907 and entered the employ of the Pennnsylvania Railroad on May 1, 1909, as rodman at Williamsport, Pa. From May, 1914, to December of that year he was transitman at Philadelphia, Pa., when he became assistant supervisor at Columbia, Pa., being transferred to Philadelphia, Pa., June 1, 1915; to Erie, Pa., on February 1, 1917, and to Baltimore, Md., on September 15 of the same year. In September, 1918, he was appointed supervisor at Johnsonburg, Pa., and in July, 1919, was appointed assistant supervisor at Baltimore, Md., from which position he was appointed supervisor at Verona, Pa., as noted above.

**B. E. Conlan**, who was appointed roadmaster on the third and fourth districts of the Denver & Rio Grande, with headquarters at Walsenburg, Colo., as noted in last month's issue, was born at Grant Center, Iowa, on February 2, 1886. He entered railway service in March, 1908, with the St. Louis-San Francisco and served consecutively as timekeeper, assistant extra gang foreman and extra gang foreman. In 1910 he became section foreman on the Spokane division of the Great Northern in British Columbia and later section foreman at Columbia River, Wash. From 1910 to 1912 he served as yard foreman and in the latter year was made section foreman on the Denver & Rio Grande, which position he held until 1913 when he became extra gang foreman on the Western division of the Western Pacific. Mr. Conlan was promoted to roadmaster in 1917 and served in that capacity until 1919 when he was appointed roadmaster on the Rio Grande Southern, which position he held until his appointment noted above.

**J. R. Scarlett**, assistant supervisor on the Pennsylvania Railroad at Baltimore, Md., has been promoted to supervisor at Verona, Pa., succeeding **C. L. P. Russell**, who has been transferred to East Liberty, Pa., in place of **M. Lipman**, who has been promoted to division engineer at Camden, N. J., as noted in another column. **W. O. Purcell**, transitman on the New Jersey division, has been promoted to assistant supervisor on the same division, with headquarters at Jersey City, N. J., succeeding **J. F. Swenson**, who has been transferred to Perryville, Md., in place of **J. T. Ridgely**, who has been promoted to supervisor at South Oil City, Pa., replacing **N. D. Vernon**, who has been transferred to Perryville, succeeding **N. B. Pitcairn**, who has been promoted to division engineer of the Conemaugh division, with headquarters at Pittsburgh, as reported elsewhere in this issue. **H. P. Heil**, transitman on the Philadelphia Terminal division has been promoted to assistant supervisor at Youngwood, Pa., succeeding **R. Woodcock**, who was transferred to Baltimore.

**Philip H. Hesgrove**, assistant roadmater on the Great Northern, with headquarters at Kelly Lake, Minn., who was promoted to roadmaster, as noted elsewhere, was born at London, England, on January 7, 1883, coming to this country in 1901, when he entered railway service with the Duluth, Missabe & Northern as an extra gang laborer, later being promoted to extra gang foreman. From October, 1904, to April, 1907, he worked as laborer, timekeeper or assistant foreman in various railroad construction camps in Minnesota. In April, 1907, he became extra gang timekeeper on the Great Northern, but resigned in November, 1908, to work on railroad station work contracts and in railroad construction camps. He re-entered the employ of the Great Northern in April, 1912, as roadmaster's clerk and in 1916 was promoted to trainmaster's clerk. From January, 1917, to February, 1919, he served as rail yard clerk and at the latter date was appointed assistant roadmaster, which position he held until his recent appointment.

**P. Hesgrove** has been appointed roadmaster on the Mesabi division of the Great Northern, with headquarters at Kelley Lake, Minn., in place of **Christ Hara**, who has been promoted to division roadmaster of the Willmar division, with headquarters at Willmar, Minn., succeeding **F. Hanson**. Mr. Hanson has been appointed division roadmaster on the Dakota division, with headquarters at Grand Forks, N. D., succeeding **P. Montgomery**, who has been appointed roadmaster on the Dakota division, with headquarters at Grand Forks, N. D., in place of **D. Sullivan**, assigned to other duties.

## PURCHASING AND STORES

**A. S. Perry** of the New York City office of the Panama Railroad Company has been appointed assistant commissary purchasing agent at New Orleans, La., a new position.

## OBITUARY

**Zachariah T. Brantner**, superintendent of the Martinsburg (W. Va.) maintenance of way repair shops of the Baltimore & Ohio, died at his home in Martinsburg on October 21 after a continuous service with this company which extended over a period of nearly 57 years. Mr. Brantner was born on July 10, 1848, at Martinsburg and entered the service of the Baltimore & Ohio on January 1, 1863, as a water boy in the Martinsburg maintenance of way repair shops, becoming an apprentice in August of that year and serving in that capacity for four years when he became a machinist. In August, 1871, he was made foreman of the shops, a position he held for 15 years. In August, 1886, he was promoted to general foreman, and in December, 1912, to superintendent of shops in which position he continued till his death.

**A. J. Himes**, valuation engineer of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, died on November 3, in that city at the age of 55 years. Mr. Himes graduated from Cornell University in 1887 and began railway work in that year as assistant engineer on the Burlington & Missouri River. In 1890 he was appointed assistant engineer of the Falls Brook Coal Company Railway, and in 1891 assistant engineer of the Deep Creek in the Alleghenies. In the latter part of that year he became city engineer of Corning, N. Y., and remained in that position until 1894 when he was appointed resident engineer on the New York State Canals, with headquarters at New York City. From 1897 to October, 1899, he was assistant engineer with the United States Board of Engineering and Deep Waterways, with headquarters at New York City. Between 1899 and 1901 he was engaged in engineering work for the city of New York. From 1901 to 1909 he was successively bridge engineer and engineer of grade elimination on the New York, Chicago & St. Louis and in the latter year was promoted to valuation engineer with headquarters at Cleveland, which position he held until 1917 when he was forced to retire from active management of the office because of ill health. **W. D. Bergen**, assistant valuation engineer at that time was appointed temporarily as valuation engineer pending the outcome of Mr. Himes' illness. Mr. Bergen will retain the title and office of valuation engineer.

A. J. Himes

# CONSTRUCTION NEWS

**The Tidewater Southern** has completed a survey of its proposed extension from Hilmar, Cal., to the San Joaquin river at a point known as Skaggs bridge, a distance of 62 miles. It has not been decided when contruction work on this line will be started.

**The Canadian National** is making location surveys for a proposed extension from Prince Albert, Sask., to Paddock Wood, a distance of 100 miles. Although the date of the beginning of construction has not been decided upon, surveying parties are at present in the field.

**The Grand Trunk** is building a passenger station at Gravenhurst, Ont. The main building will be 68 ft. by 25 ft. with a 15 ft. addition for baggage, the construction being of concrete with walls of brick to the sill line and a frame superstructure.

**The Kansas City Terminal Railway Company** will build a subway 1,245 ft. long, 100 ft. wide, costing approximately $447,000; also a viaduct 950 ft. long, on Holmes street, to cost $245,000.

**The proposed railway from** Comanche to Eastland, Tex., via De Leon and Desdemona, will be approximately 50 miles long and will include four bridges from 50 to 80 ft. long. The date for bids has not yet been decided. L. B. Williams will be president and H. Burks secretary-treasurer of the new line, while A. E. Firmin is chief engineer.

**The Rock Island & Oklahoma,** a subsidiary of the Rock Island System, is building a line from Chattanooga, Okla., to Grandfield, a distance of about 15 miles, to reach the Texas oil fields. L. C. Fritch, Chicago, Ill., is vice-president and chief engineer.

**The Andalusia, Florida & Gulf,** a new company for which the lines of the Florida, Alabama & Gulf were recently purchased, will build an extension of about 18 miles from Falco to Andalusia, Ala. J. I. Robbins of Talco is president of the new company.

**The Toyah Valley Railroad Company** will build a line about 18 miles long from Orla, Tex., on the Panhandle & Santa Fe, through rolling country to the lines of the Toyah Valley Sulphur Company, near Maverick Springs. M. J. Epley, 809 Hennen Building, New Orleans, La., is president and chief engineer; Joseph Dellery, treasurer, and J. A. Daniel, secretary.

## IRON AND STEEL

**The Pennsylvania Railroad Company** is inquiring for 200,000 tons of steel rails for delivery after the return of the railroads to their owners.

**The Erie Railroad Company** is in the market for from 20,000 to 30,000 tons of rails.

**Belgian** Interests are reported to have ordered 20,000 tons of open-hearth rails from the United States Steel Corporation.

**The New York Central Railroad Company** is expected to enter the market shortly for a large tonnage of rails to be delivered in 1920.

**Sophus Berendsen,** 15 Broad street, New York, is inquiring for 300 railroad jacks for export to Denmark.

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**The Safety Drive**—The first complete records in the National Railroad Accident Prevention Drive, held during the last two weeks of October, were obtained from the roads of the Northwestern region. With a mileage of 53,000 and an aggregate working force of 275,000, this region showed a casualty reduction of 67 per cent during the two weeks of the drive as compared with the corresponding period of last year. During the last two weeks of October, 1918, the roads comprising the Northwestern region had 840 casualties to railroad employees, of which 16 were fatal. During the same period this year, as a result of the drive, there were only 273 casualties to railroad employees, of which 14 were fatal.

# SUPPLY TRADE NEWS

## GENERAL

**The Engineering Service Corporation** of Illinois, successor to the W. K. Palmer Company, engineers, has recently moved its offices into new quarters at 15 West Tenth street, Kansas City, Mo.

**The Pettibone-Mulliken Company,** Chicago, has awarded a contract to Westinghouse, Church, Kerr & Company, New York City, for a one story foundry at Chicago, 150 ft. by 240 ft., to cost $200,000, including equipment.

**Correction**—In the November issue, page 423, notice was made of the opening of the foreign offices of the **Buda Company,** Harvey, Ill., in which the name of the English representative and the addresses of the London and Buenos Aires offices were in error. Colonel R. S. Chaplin is the representative with offices in London at 147 Oxford street, W. 1; and the correct address of the Buenos Aires office is 769 Avenida de Mayo.

**The International Steel Tube Company** has been incorporated under the laws of Delaware with a capital of $2,500,000, of which $1,000,000 is preferred and $1,500,000 common stock, and is planning the immediate construction of the first unit of a seamless tube plant at Cleveland, Ohio. **William P. Day,** president of the International Steel Tie Company, is president and **Thomas Tarrock,** former superintendent of the Republic Steel Company, Youngstown, Ohio, is vice-president of the new concern.

**The Detroit Star Grinding Wheel Company** has been formed by merging the business of the Detroit Grinding Wheel Company and the Star Corundum Wheel Company both of Detroit, Mich. The officers of the new company are: John R. Kempf, president; J. T. Wing, vice-president; F. H. Whelden, secretary and treasurer. Edward N. Dodge, formerly with the Norton Company, Worcester, Mass., has been appointed general sales manager. The company's plant and offices will be at 241-61 Cavalry avenue, Detroit, Mich.

## PERSONAL

**W. H. Scales,** chief designing engineer of the Lackawanna Bridge Company, with headquarters at Buffalo, N. Y., has resigned to become associated with W. E. Russ, architect, of Indianapolis, Ind., as chief of engineering and construction.

**Louis J. Schneider** has been appointed general sales manager of the Clark Tructractor Company, Chicago. Mr. Schneider is a graduate of Stevens Institute of Technology, Hoboken, N. J. He has been closely identified for many years with the automotive industry, having served in the engineering department of the Hyatt Roller Bearing Company during 1911 and in the sales department from 1912 to 1916; during the early part of 1917 he was sales manager of the Jackson Rim Company, Jackson, Mich., and later in the same year he became sales manager of the Harrison Radiator Company, Lockport, N. Y., which position he resigned to take charge of the sales department of the Clark Tructractor Company.

Louis J. Schneider

**John B. Jordan,** assistant manager of the railroad sales department of the Crane Company, with headquarters at Chicago, has been appointed manager of the department with

the same headquarters, succeeding **F. D. Finn,** who has been granted an indefinite leave of absence.

**M. E. Allen,** engineer in charge of sales for the Central State Bridge Company, Indianapolis, Ind., has been appointed contracting engineer in charge of sales for the Federal Bridge & Structural Company, Waukesha, Wis., with headquarters in the reopened Chicago office of that concern at 1228 Peoples Gas building.

**Orville A. Pier** has been appointed secretary-manager of the National Association of Railroad Tie Producers, with office at 205 Security building, St. Louis, Mo. **R. E. Hussey** continues his connection as secretary of the Board of Directors of this association, with office at 1102 National Bank of Commerce building, St. Louis, Mo.

**J. L. Terry** has been appointed assistant to the president of the Q. & C. Company, with headquarters at St. Louis, Mo. He was born at Washington, Iowa, in 1881, and entered railway service in 1899. He served in various capacities on the Iowa Central; Atchison, Topeka & Santa Fe; Colorado & Southern and Denver & Rio Grande, and in October, 1914, resigned as general superintendent of the Denver, Laramie & Northwestern to engage in railroad supply work. In October, 1916, he was appointed representative of the western territory of the Q. & C. Company, with headquarters in St. Louis, and in July, 1918, left for France as a captain in the United States Army. Mr. Terry was later promoted to major in command of the Rennes division transportation corps and as superintendent of the American railroad transportation service on the Rennes-Brest division of the Etat railroad. In August, 1919, he returned to the United States and resumed work with the Q. & C. Company.

J. L. Terry

**Lieutenant-Colonel Russell W. Stovel,** who recently returned from France, where he served as chief of the Terminal Facilities division of the Army Transport Service, has been appointed consulting engineer of Westinghouse, Church, Kerr & Co., New York, and as a member of that organization will devote his entire time to the company's electrical and mechanical work. Mr. Stovel has had an extended experience in electrical and mechanical problems connected with central power station and steam railroad electrification work, including the fundamental economics, the design, construction, equipment and operation. He was graduated from McGill University in 1897 with the degree of electrical engineer and the following year entered the employ of the Westinghouse, Church, Kerr & Co.; he later became an assistant engineer, then successively engineer in charge, mechanical engineer of the company, and finally managing engineer. While with Westinghouse, Church, Kerr & Co. Mr. Stovel handled the design and construction of the Canadian Pacific passenger station and steamboat pier at Vancouver, B. C., and other important projects. In 1914, Mr. Stovel left Westinghouse, Church, Kerr & Co., to become managing engineer for Gibbs & Hill, consulting engineers, New York. For this company he had direct churge of the Paoli-Chestnut Hill electrifications of the Pennsylvania Railroad, the Elkhorn grade electrification of the Norfolk & Western and the electrification of the New York Connecting Railway. While in France Mr. Stovel had charge of matter relating to the procurement, maintenance and operation of terminal facilities under jurisdiction of the American Transport Service.

Lieut.-Col. Russell W. Stovel

**C. W. Cross,** special railroad representative of the Chicago Pneumatic Tool Company, with office at Chicago, has been appointed manager of western railroad sales with the same headquarters, succeeding **L. C. Sprague,** who has resigned to become general mechanical inspector of the Galena-Signal Oil Company, with office at Minneapolis, Minn.

**Robert C. McCarter,** consulting engineer to all the European Westinghouse Companies and president and managing director of the Russian Westinghouse Company, with office at New York City, and **William Cooper,** consulting engineer, who prior to the establishment of his office in New York in 1917 was European manager and chief engineer for Robert W. Hunt & Company, have formed a partnership and will act as consulting engineers under the firm name of McCarter & Cooper, with office at 165 Broadway, New York City.

## TRADE PUBLICATIONS

**A "Shockless" Crossing.**—The Alexander Railroad Crossing & Equipment Company, Chicago, has issued a folder describing and illustrating the swing rail construction of the crossing manufactured by this company. The folder also discusses briefly the disadvantages of ordinary types of crossing construction and points to the satisfactory experience which railroads have had with the Alexander crossing during 10 years of actual service.

**Concrete Pipe.**—A bulletin containing a variety of illustrations of the manufacture, use and testing of concrete pipe for culverts, drains, pressure pipes and sewers has been issued by the American Concrete Pipe Association, Chicago.

**Concrete Highway Grade Crossings.**—A report on the possibilities of concrete slabs for the paving of highway grade crossings on railways has been published by the Portland Cement Association, Chicago, in the form of an eight-page pamphlet illustrated with photographs of actual installations of this nature.

**Air Hoists and Elevators.**—Catalog No. 149, issued by the Whiting Foundry Equipment Company, Harvey, Ill., is devoted to the description of pneumatic and hydro-pneumatic hoisting equipment. The air hoists include both the vertical and horizontal types, these designs being made in two different styles, one for ordinary service and the other for use where delicate control is necessary. The compressed air elevators are intended for one-story lifts only and have capacities up to 6,000 lb.

**Blawforms for Light Walls and Foundations.**—A small pamphlet of 27 pages, 31 illustrations, known as Bulletin No. 203, has been recently issued by the Blaw-Knox Company, Pittsburgh, Pa. It explains the advantage of the Blaw light wall and foundation forms and shows, so far as possible in the limited number of illustrations, the variety of work for which they are adapted. Considerable space is given to a detailed description, in which are incorporated figures, photographs and tables, of the method of assembling and applying them to various types of construction.

**Milliken Buildings.**—The Milliken Brothers' Manufacturing Company, Woolworth Building, New York, has published a new catalog No. 10, descriptive of Milliken Buildings. Structures of this type are built under a standard truss system, which makes use of small, interchangeable, standardized structural steel units. The catalog is 8½ in. by 11 in. and is illustrated with buildings of this character erected for the United States Government and other important interests. Space is also given to the transmission towers, radio towers and special poles built by the company. A companion book of like size, known as Catalog No. 11, has been issued as an erection handbook, which forms a guide to the construction of any Milliken Building from foundation to roof.